SIEMENS

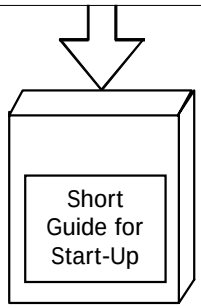
SIJECT 16i
Start-Up

Technical Manual 08.2006 Edition

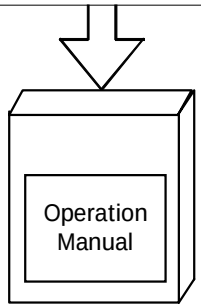
Manufacturer Documentation

SIJECT 16i Document Structure

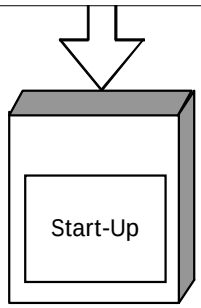
General Documentation: Catalog



User Documentation: Operation Manual



Technical Documentation: Start-Up



SIEMENS

SIJECT 16i
Start-Up

Technical Manual

SIJECT16i Control System 1

Installation of Control System 2

Start-up 3

Programming Tool 4

Technical Appendix 5

Valid for

Control System	*Firmware Version*
SIJECT 16i	1.14

08.2006 Edition

SIJECT® Documentation

Key to editions

The editions listed below have been published prior to the current edition.

The column headed "Note" lists the amended sections, with reference to the previous edition.

Marking of edition in the "Note" column:

A .... New documentation.

B .... Unchanged reprint with new order number

C .... Revised edition of new issue.

Edition	Order No.	Note
12.2000	6AT1931-5AB61-0BA0	A
01.2004	6AT1931-5AB61-0BA1	A
08.2004	6AT1931-5AB61-0BA1	C
08.2006	184000000058	C

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Exclusion of liability

We have checked that the contents of this document correspond to the hardware and software described. Nonetheless, differences might exist and we cannot therefore guarantee that they are completely identical. The information contained in this document is reviewed regularly and any necessary changes will be included in the next edition. We welcome suggestions for improvement.

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Subject to technical changes without notice.

Safety Guidelines

This Manual contains notices intended to ensure your personal safety, as well as to protect products and connected equipment against damage. Safety notices are highlighted by a warning triangle and presented in the following categories depending on the degree of risk involved:

Danger

Indicates an imminently hazardous situation which, if not avoided, **will** result in death or serious injury or in substantial property damage.

Warning

Indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury or in substantial property damage.

Caution

Used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate injury or in property damage.

Caution

Used without safety alert symbol indicates a potentially hazardous situation which, if not avoided, **may** result in property damage.

Notice

Indicates important information relating to the product or highlights part of the documentation for special attention.

Qualified Person

The unit may only be started up and operated by a **qualified person or persons**. Qualified persons as referred to in the safety guidelines in this document are those who are authorized to start up, earth and label units, systems and circuits in accordance with relevant safety standards.

Proper use

Please note the following:

Warning

The unit may be used only for the applications described in the catalog or the technical description, and only in combination with the equipment, components and devices of other manufactures as far as this is recommended or permitted by SIEMENS.

This product must be transported, stored and installed, and maintained and operated with care to ensure that it functions correctly and safely.

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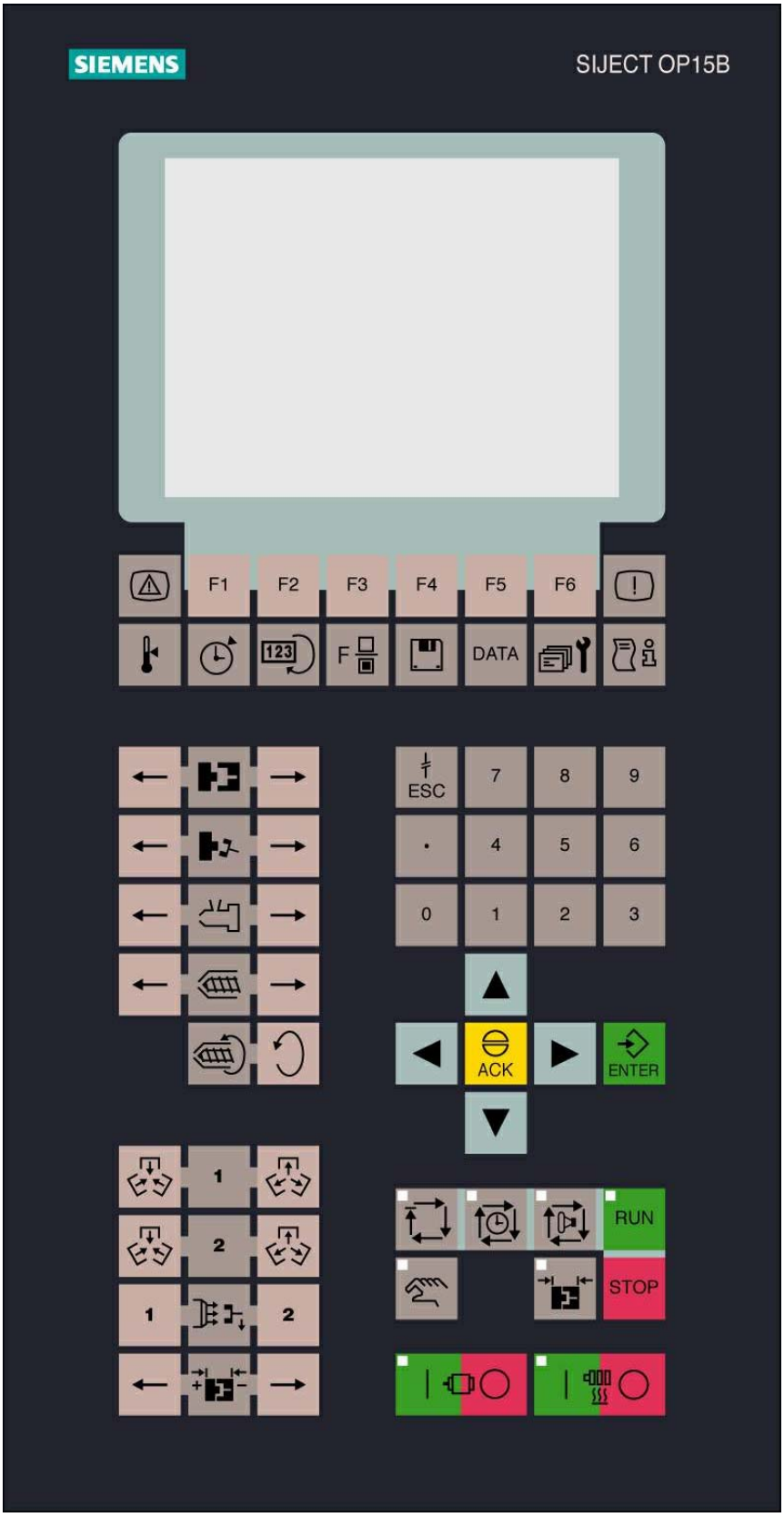
Operator Panel



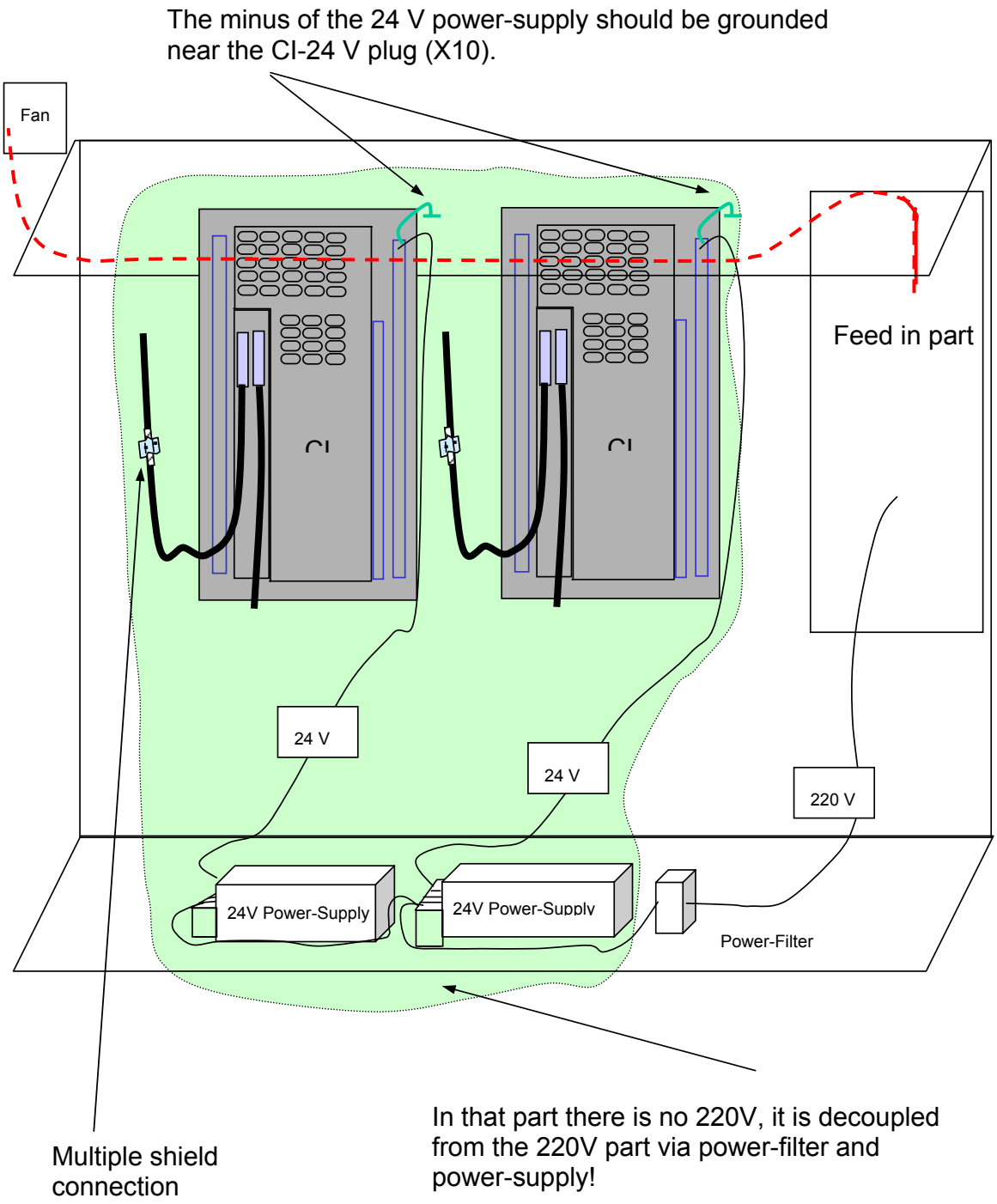
Installation Guidelines for SIJECT Systems

General

The SIJECT system is a control system used in different injection molding machines and under different environmental conditions. To avoid system disturbance, malfunctions or failures when it runs, we recommend following installation guidelines:

Basic EMC requirements

- Connect all metal parts of the electric cabinet together with the contact over a large area so as to be properly conducting (i. e. avoid paint to paint connections). Use contact or scratch washers, if necessary.
- The mounting plate of the cabinet – where the CI board is fixed - should be galvanized (zinc-coated) and not painted.
- Cross-talk is generally reduced by running the signal wires close to sheet metal (mounting plate, metal casing, metal rails). It also prevents antenna effects.
- Avoid using longer cables than necessary.
- Minimize the distance between the supply wires and return wire. Twisting the wires of the same circuit is the optimized solution.
- Connect spare wires to cabinet ground (mounting plate, metal casing) on both ends. This will increase the immunity and decrease the emission.
- Provide contactors, relays, solenoid valves, electromechanical operating hour counters etc. (in general: switched inductances) with quenching components. They must be installed directly at the corresponding coil (distance less than 15 cm).
- Switched inductances should be located at least 10 up to 15 cm apart from SIJECT systems (not in an immediate proximity of the near-field).


The minus of the 24 V power-supply should be grounded near the CI-24 V plug (X10).
Fan
Feed in part
CI
CI
24 V
24 V
220 V
24V Power-Supply
24V Power-Supply
Power-Filter
Multiple shield connection
In that part there is no 220V, it is decoupled from the 220V part via power-filter and power-supply!

Example for cabinet design with two CI-Systems

- The minimum distance between the different voltage levels (i. e power cables, signal-/bus cables) should be 10 cm (right-angled crossing is allowed).
- Connect power filters so that they are connected to the mounting plate over a large area (not only via a ground wire).

- Separate input and output lines of the filter (at least 20 cm).
- Always install filters as short as possible to the source of the interference or to the potentially susceptible device.

Cable shielding

- Generally is valid: Cable shields have to be connected to large metallic conductive surfaces (mounting plate, cabinet housing) on both ends. The connection of the shield with large surface is normally done via the plug casing. The available saddles have to be used (X200, X201, X202, X207, X305).
- Only in this way, a protection is ensured against high frequency noise.
  Provided, that a good equipotential bonding system is available within the whole machine.
-

Example for shield connections via large surface (low inductive)

Facts
If a cable shield is connected on both ends a low frequency shield current can flow. Hence signals can be disturbed. A possibly existing potential difference is diminished by parallel connection of other cables. Then the shield current is lowered to a system-compatible measure.

From there
It should always be checked whether 1/10 of the shield resistance is placed in parallel. This potential equalization can be done with cable trays, machine frame, mounting plate, other shields or other parallel cables.

- Shield always may be connected to the mounting plate or cabinet housing several times. Advantage: Additional reduction of the effective antenna lengths and reflections!

1 SIJECT 16i Control System

1.1 Components of SIJECT 16i

What is SIJECT 16i?

The SIJECT 16i is a controller for injection molding machine. It offers solutions for injection molding machines from low-end applications to high-end applications.

Hardware components

It consists of the following hardware components, in which the parts marked with a star symbol (*) can be ordered separately:

- CI: Compact interface, main controller, i.e., CPU and I/O board.
- OP: Operator panel, with LCD display and membrane keyboard, i.e. CPU, LCD, and membrane Keyboard
- Cable: Communication cable between CI and OP.
- Multimedia card (MMC card*):

  The memory space of MMC card is 32 Mbytes. It can install PLC application programs, maximum 50 sets recipe data, OP-menus and a customer specific picture (max.16KB).

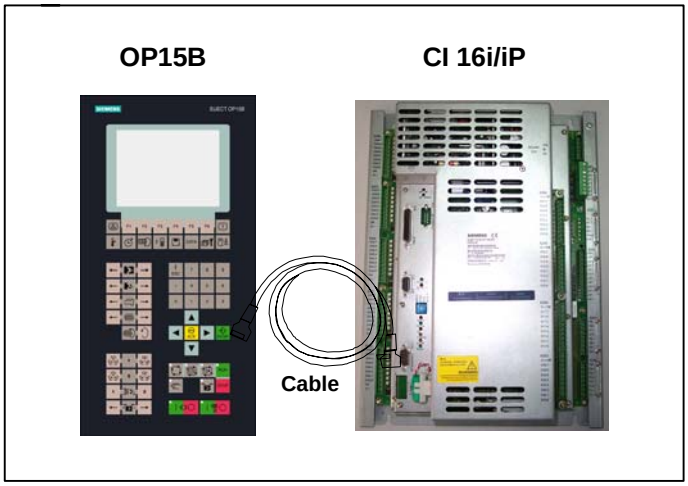


Fig 1-1 Hardware components of SIJECT 16i

Software components

- System software on the permanent Flash-EPROM of the CI:
  - Loading kernel (SIJECT Sijload): loads all the remaining part of the software of micro-controller. It is available in PRODIS system that can be free downloaded from Internet (Please refer to Notice on next page for details).
  - PLC application program: executes the Integrated PLC User Program cyclically. Before machine set-up, customers should firstly install PLC application program by themselves.

- Programming tool:
  - SIMATIC STEP7 V5.x*;
  - OP15B menu editor tool (MECO program): for OP15B, there is a HMI engineering tool for menu editor. MECO program is also in PRODIS system together with Sijload program (Refer to Notice below).

User data

User data are:

- Customer specific picture
- Recipe data
- PLC program

PLC program

The STEP7 PLC program for CI 16i/16iP is backed up by battery. The delivered CI 16i/16iP does not include any STEP7 PLC program, and the battery is not plugged in. The customer should prepare PLC program , first plug in battery then download STEP7 PLC program to CI16i/16iP unit.

Please see section **3.5.2 Automatic uploading of PLC application to PLC module** for detailed function descriptions.

Notice

Actual information, documentation (only English) and application examples in STEP 7 are on Internet available.

Actual Link: http://www4.ad.siemens.de/
(Please input “SIJECT“ in Search box.)

For more information or proposals, you can link:

http://www.siemens.com/motioncontrol

http://www.ad.siemens.de/csinfo

Or contact (Europe):

Email: wolfgang.radermacher@siemens.com

Email: wolfgang.zapf@siemens.com

Technical support

Email: dietmar.antwerpen@siemens.com

1.2 Technical Data

Connected load

Table 1-1 Connected load

Parameter	Min	Type	Max	Unit	Remarks
Supply voltage	20.4	24	28.8	V	
Power of CI and OP		20	35	W	
Current consumption of each output		2		A	
Digital input/output		24		V	
Proportional valve		24/38		V	*

* It depends on the resistance of proportional valve.

Weight

Table 1-2 Weight

Component	Weight (Kg)
CI component	4.1
OP component	1.8

Dimensions

Table 1-3 Component Dimensions

Component	Dimensions: H×W×D (mm)
CI component	390×288×84.5
OP component	392×202×36

Environmental operating conditions

Table 1-4 Environmental operating conditions

Parameter	Description
Temperature range	0 ~ +50°C
Permissible relative humidity	5...95% without condensation
Air pressure	700...1,060hPa

Transport and storage conditions

Table 1-5 Transport and storage conditions

Parameter	Description
Temperature	Transport: -40~+70°C Storage: -20~+55°C
Permissible relative air humidity	5...95% without condensation
Air pressure	700...1,060hPa
Transport height	-1,000…3,000 m

Free fall in transport package	500mm

Protective quality and degree of protection

Class of protection level to IEC 536, CI: IP20, OP: IP54
PE terminal required.
Foreign matter and water protection to IEC 529.

System characteristics

Table1-6 System characteristics

System		SIJECT CI 16i	SIJECT CI 16iP
PLC module		314	314-2DP
Programming		SIMATIC STEP 7	SIMATIC STEP 7
Guaranteed memory	Load memory	256 Kbytes	524 Kbytes
	Work memory	163 Kbytes	460 Kbytes
Prog. memory (after loaded technology)	Load memory	-*	498 Kbytes
	Work memory	-*	437 Kbytes
Timer		128	256
Counter		64	256
Digital input (DC24V)		31	31
High speed counter		1	1
Digital output (2A)		40	40
Short-circuit protection		Yes	Yes
Thermocouple input (16 Bit)		8	8
Inputs for linear scales (1kΩ~10kΩ, 12 Bit)		4	4
Inputs for fast analog signals (0~10V, 14-Bit resolution)		-	2 (X207)
Analog output (+/-10V, 12 Bit)		4	4
Proportional valve current output (+24~38V / 0.75~1.4A, 12Bit)		2 (X306) **	-
OP interface (serial)		1	1
MPI interface		1	1
P_Bus interface		1	1
Profibus-DP interface		-	1
Memory card slot		1	1
System power supply		DC 24V	DC 24V

* No correspondent technology blocks for CI 16i.

** For CI16i, two outputs can only be used alternatively as voltage output (+/- 10V) or as current outputs (0.75-1.4A).

1.3 Order Number

General

The SIJECT series product can be ordered in the form of package. But you also can receive the components separately if you only order the option. It depends on the configuration and can meet your requirements. Please see the order number of all components in the following table.

Table 1-7 Order Number

No.	Component	MLFB (Order No.) / SNC No.
2	SIJECT 16i (CI16i+OP15B FV1) SIJECT 16i (CI16i+OP15B FV2)	6AT1131-6CD21-0XB0 6AT1131-6CD21-0XC0
3	SIJECT OP15B FV1 (English, Chinese, Turkish, Russian) SIJECT OP15B FV2 (English, Chinese, Spanish, Reserve)	6AT1131-5BB20-0XB0 6AT1131-5BC20-0XB0
4	SIJECT CI15i	6AT1131-5DC20-0AC0
5	SIJECT CI16i	6AT1131-6DD21-0AB0
6	SIJECT CI16iP Step B	6AT1131-6DF21-0AB0
7	Communication cable	6AT1131-0EA00-0AA0 China only
8	SIJECT adapter	6AT1131-0FA00-0AA0
9	Multimedia Card (MMC card)	6AT1131-0GA00-0AA0
10	Lithium battery for SIJECT CI boards	6FC5247-0AA18-0AA0
11	elcom keyboard (Without Haitian logo)	6AT1131-0HA00-0AA0 China only
12	elcom keyboard (With Haitian logo)	6AT1131-0HB00-0AA0 China only
13	SIMATIC Manager V5.2	6ES7810-4CC06-0YX0
14	P_BUS cable (2.5m)	6ES7368-3BC51-0AA0
15	P_BUS cable (5.0m)	6ES7368-3BF01-0AA0
16	Profi_bus cable	6XV1830-0EH10-1AB0
17	Profi_bus Connector 1	6ES7972-0BA40-0XA0
18	Profi_bus Connector 2	6ES7972-0BB40-0XA0
19	Short Guide for Start-up	184000000060 China only
20	Operation Manual (OP15B) SIJECT 16i, English	184000000059 China only
21	Operation Manual (OP15B) SIJECT 16i, Chinese	184000000062 China only
22	Start Up Manual (OP15B) SIJECT 16i, English	184000000058 China only
23	Start Up Manual (OP15B)	184000000061

	SIJECT 16i, Chinese	China only
24	Start Up Manual (OP15B) SIJECT 15i, English	A5E00393636 China only
25	Start Up Manual (OP15B) SIJECT 15i, Chinese	A5E00393637 China only

2 Installing the Control System

2.1 Installing and Dismantling

Warning

Do not install when the equipment is live! Do not dismantle when the equipment is live!

The modules contain electrostatically sensitive devices. It must be ensured that persons without ESD protection never touch printed circuit boards or components when handling operator panel (OP) and CI unit.

Procedure

Prior to installation, you should prepare 4 nuts (M3) for OP installation and 4 cross-head screws (M4) for CI installation. The sheet metal can not have any paint. The thickness of a sheet metal for mounting shall not be less than 2 mm.

1. Install the CI within the electrical cabinet;
2. Install the Operator Panel on the control rack of injection molding machine;
3. Connect CI and OP with communication cable;
4. Connect the wiring of periphery circuit (I/Os, thermocouple, linear scale, proportional valve, etc.);
5. Connect entry wire of power supply.

Dismantling the control system

The control components are dismantled as described above in the reverse order.

Danger

Install grounding connection before plug-in of screw-terminal block to DC24V mains.

Make sure that all delivered interface connectors (female) are plugged in before operation.

Battery set-up

The back-up battery is not connected to the CI board in original package. It is necessary to connect the back-up battery to CI board and reset the memory prior to the system start-up. Please refer to operation sequences of battery set-up as follows.

Operating sequence:

1. When the system is firstly power on, observe the status of LEDs: BATF (red), DC5V (green) and SF (red) are lighting on, and STOP (yellow) is flashing. PLC should be reset;
2. Switch the mode selector S1 to position **MRES** by screwdriver and observe the status of LEDs: BATF (red) and DC5V (green) are still on; SF (red) is off; STOP (yellow) will flash rapidly at first, then stay on;
3. Switch the mode selector S1 to **RUN_P,** and you will find that STOP (yellow) is off and RUN_P (green) is on;

4. Put the plug at the end of the battery cable into the connector of the CI board (pay attention to the pole of battery!), and BATF (red) is off; ;
5. Insert the battery into the battery holder, and the battery installation is finished. You can download the PLC program.

Caution

In case that SF (red) keeps bright and STOP (yellow) is always flashing in the above-mentioned process, you should repeat step 2 and step 3 until both LEDs go dark.

Battery Replacement

Operating steps:

1. When battery alarm occurs (a flag (DB1.DBX59.1) will be set to 1), the lithium battery must be replaced;
2. Pull out the used lithium battery;
3. Replace it with a new one;

Warning

1. Exchange battery with power on. Otherwise program will be lost.
2. There is risk of fire, explosion or combustion. Do not recharge, disassemble, crush, heat above 212 ℉ (100℃), or incinerate.

Mounting dimensions

The dimensions shown below are important when installing the control components:

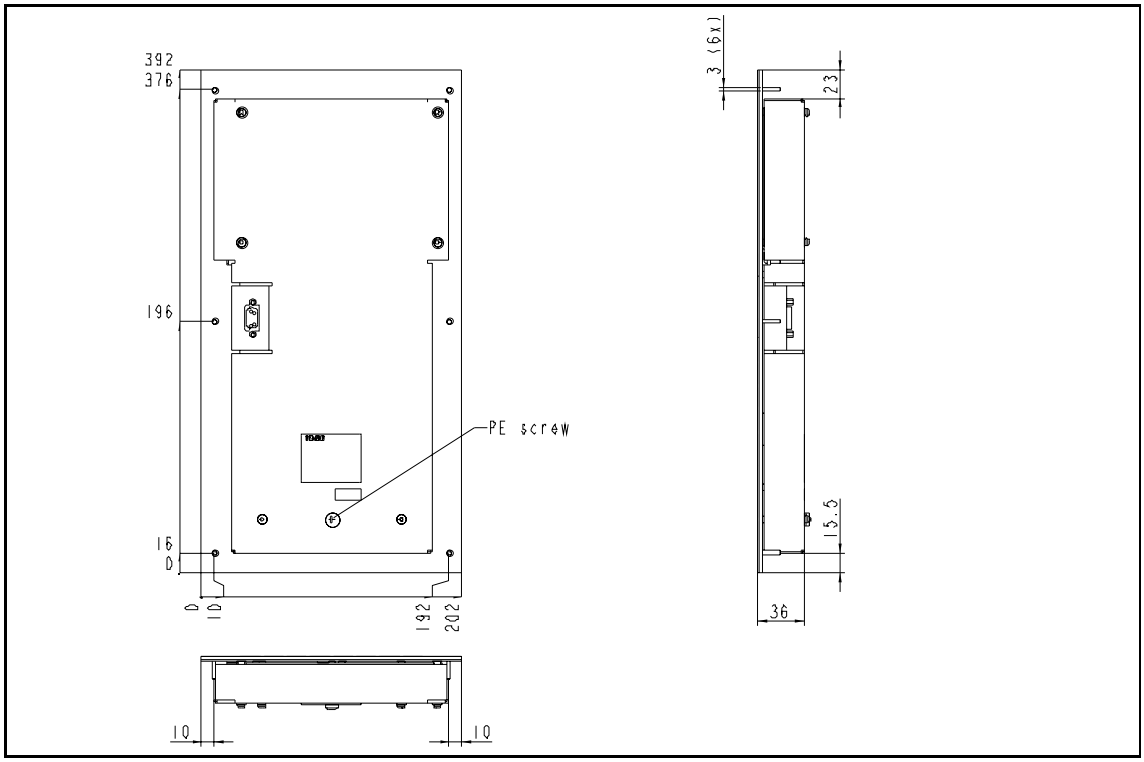


Fig. 2-1 Mounting dimensions of OP15B

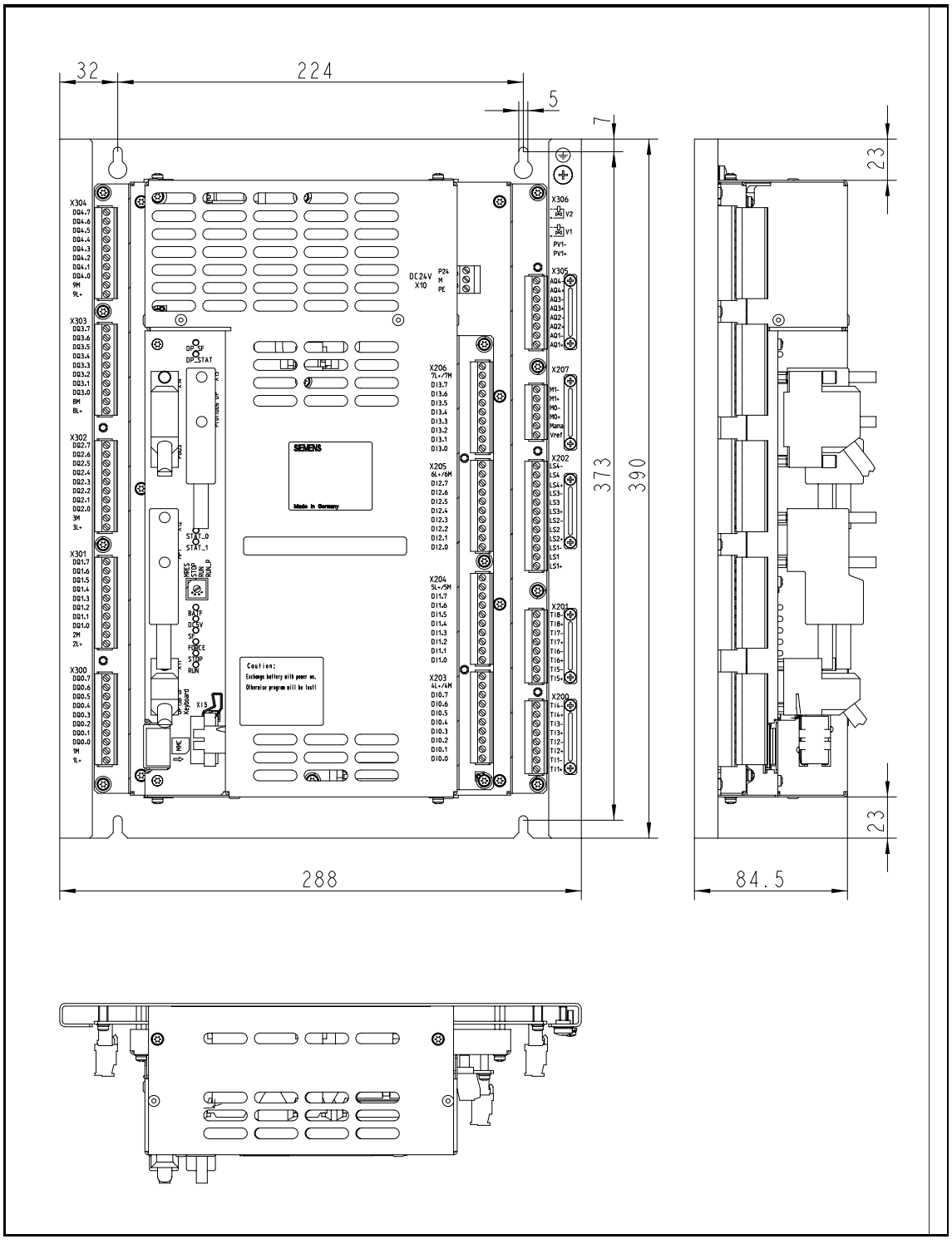


Fig. 2-2 Mounting dimensions of CI

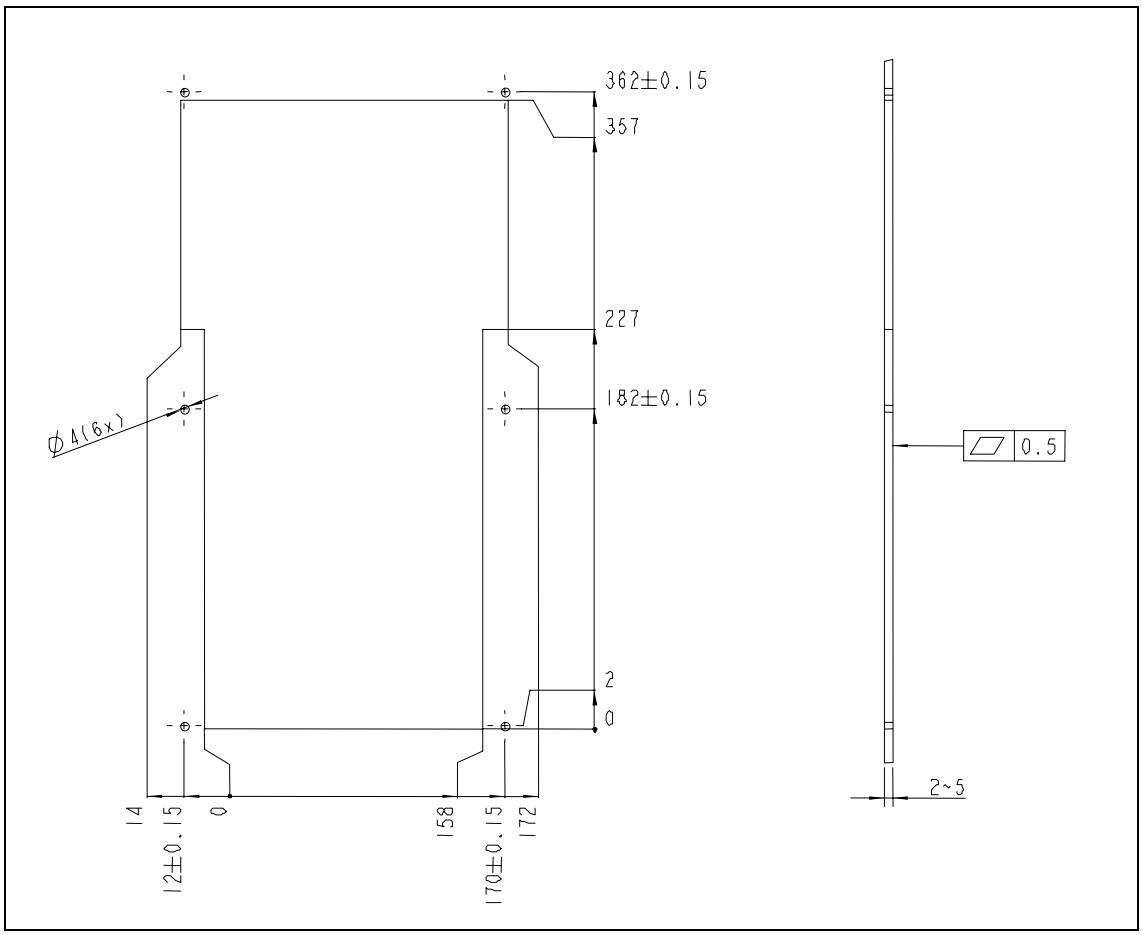


Fig. 2-3 Section dimension for OP15B

2.2 Interfaces and Cabling

Position of interfaces and front panel elements

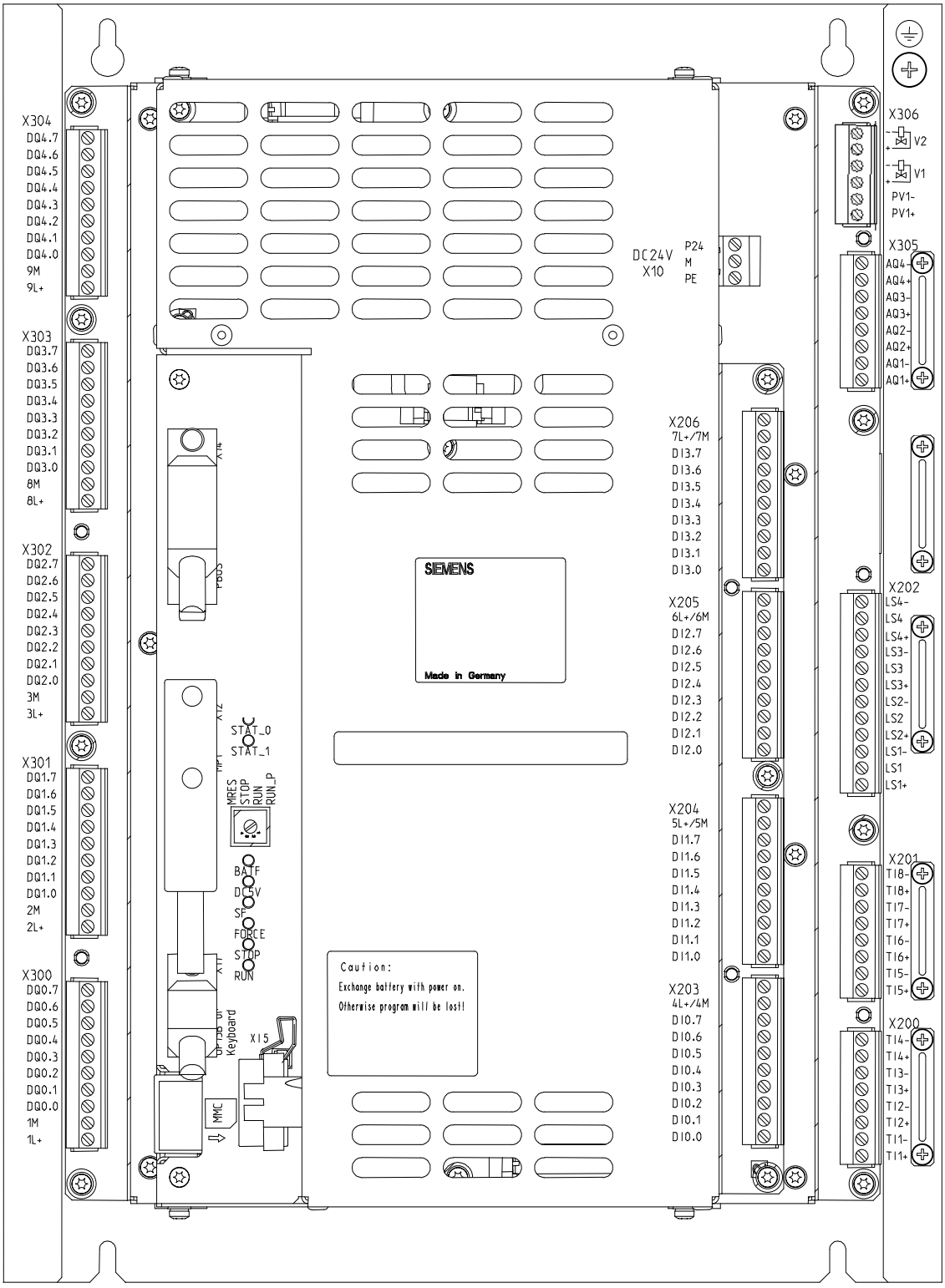


Fig.2-4 User interfaces for SIJECT CI16i (for reference)

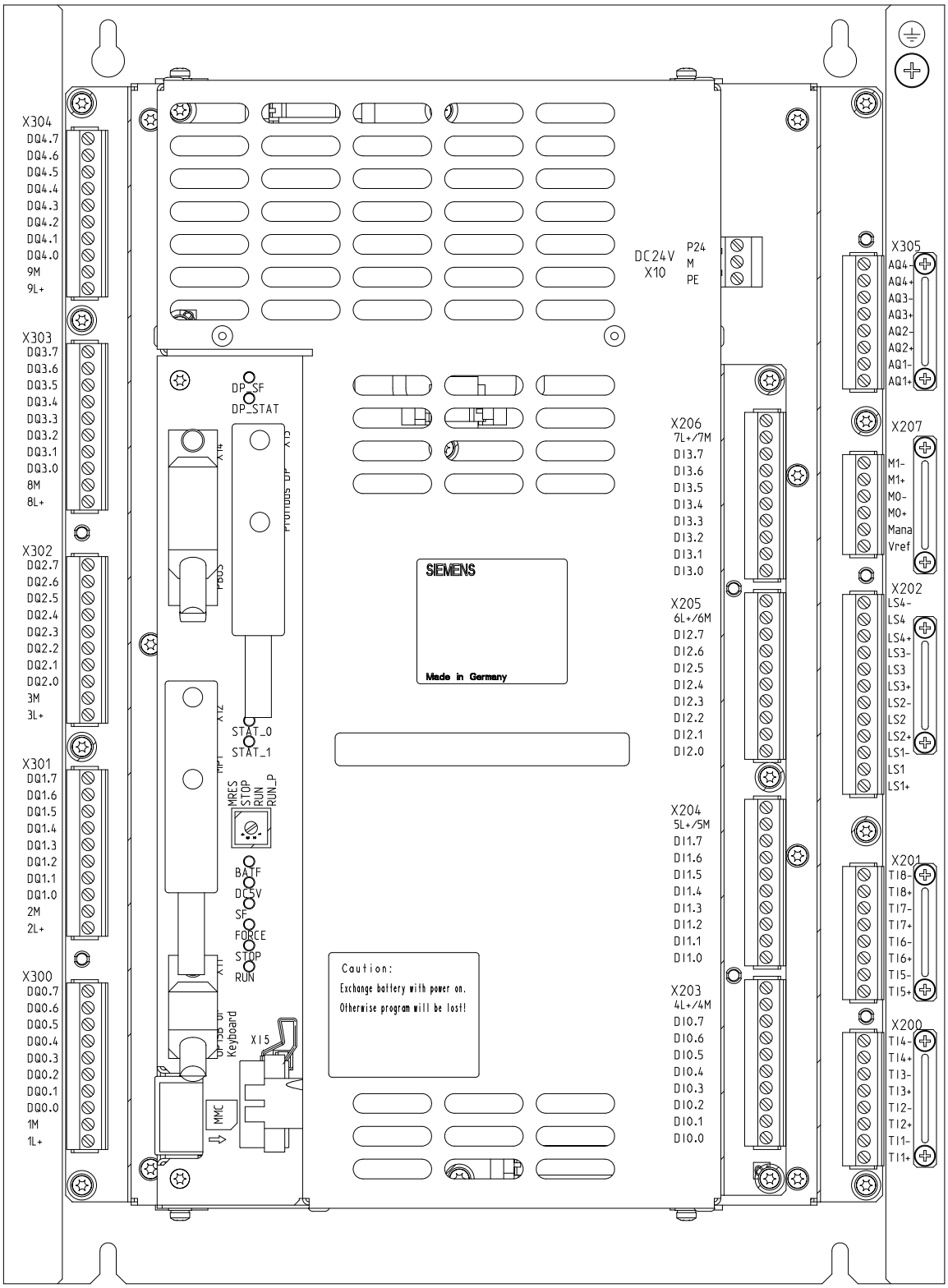


Fig.2-5 User interfaces for SIJECT CI16iP (for reference)

Interfaces

CI

- **Power supply connector (DC24V) ***
  3 – pin screw-terminal block for connecting the power supply.
- **X11 — OP interface**
  9 – pin sub-D male connector for connecting OP and providing power supply for OP.
- **X12 — MPI / RS232 interface**
  9 – pin sub-D female connector for communicating with PC/PG and other standard OP.
- **X14 — P_BUS**
  25 – pin sub-D female connector for periphery extension.
- **X15[1] — Profibus**
  9 – pin sub-D female connector for connecting controller (Profibus protocol).
- **X200, X201 — Temperature input ***
  8 – pin male connector (2 sets) for connecting thermocouple inputs.
- **X202 — Analog input ***
  12 – pin male connector (1 set) for connecting linear scale inputs.
- **X203, X204, X205, X206 — Digital input ***
  10 – pin male connector (4 sets) for connecting digital inputs, 1 pin of them (DI3.7/X206) is adapted for connecting high-speed input including proximity switch.
- **X207[2] — Fast Analog Inputs ***
  6 – pin male connector (1 set) for two fast analog inputs (10V) and for the reference power output supplied by the system (DC 10V).
- **X300, X301, X302, X303, X304 — Digital output ***
  10 – pin male connector (5 sets) for connecting digital outputs.
- **X305 — Analog output ***
  8 – pin male connector (1 set) for connecting analog output for proportional pressure and flow valve with external driver card.
- **X306[3] — Current output for proportional pressure and flow valve ***
  6 – pin male connector (1 set) for connecting power output for proportional pressure and flow valve with integrated driver card.

Notice

Temperature rating of field-installed conductor shall be 75℃ only for the Digital Outputs (X300, X301, X302, X303 and X304), and Analog Output (X306). No marking is required when intended for connection to control circuit conductors only.

For the parts marked with a star symbol (*), please use terminal blocks made by PHOENIX CONTACT GMBH & CO (E60425), catalog number MVSTBR2.5/X-ST-5.08, where X can be 6, 8, 10 OR 12.

[1] It is only applicable for SIJECT CI 16iP.

[2] It is only applicable for SIJECT CI 16iP.

[3] It is only applicable for SIJECT CI 16i.

OP

- **X21 — CI interface**
  9 – pin sub-D female connector for connecting CI.

LEDs 10 LEDs for fault and status displays

Operating elements Mode selector S1

Connecting cables The components are wired up as shown in the following Connection Diagram. Please refer to this figure for the type of cables required.

Warning

In practical use, the length of those wires transmitting digital and analog input/output signals should be less than 30 meters. In case the wire length is more than 30 meters, corresponding measures should be taken against surge interference.

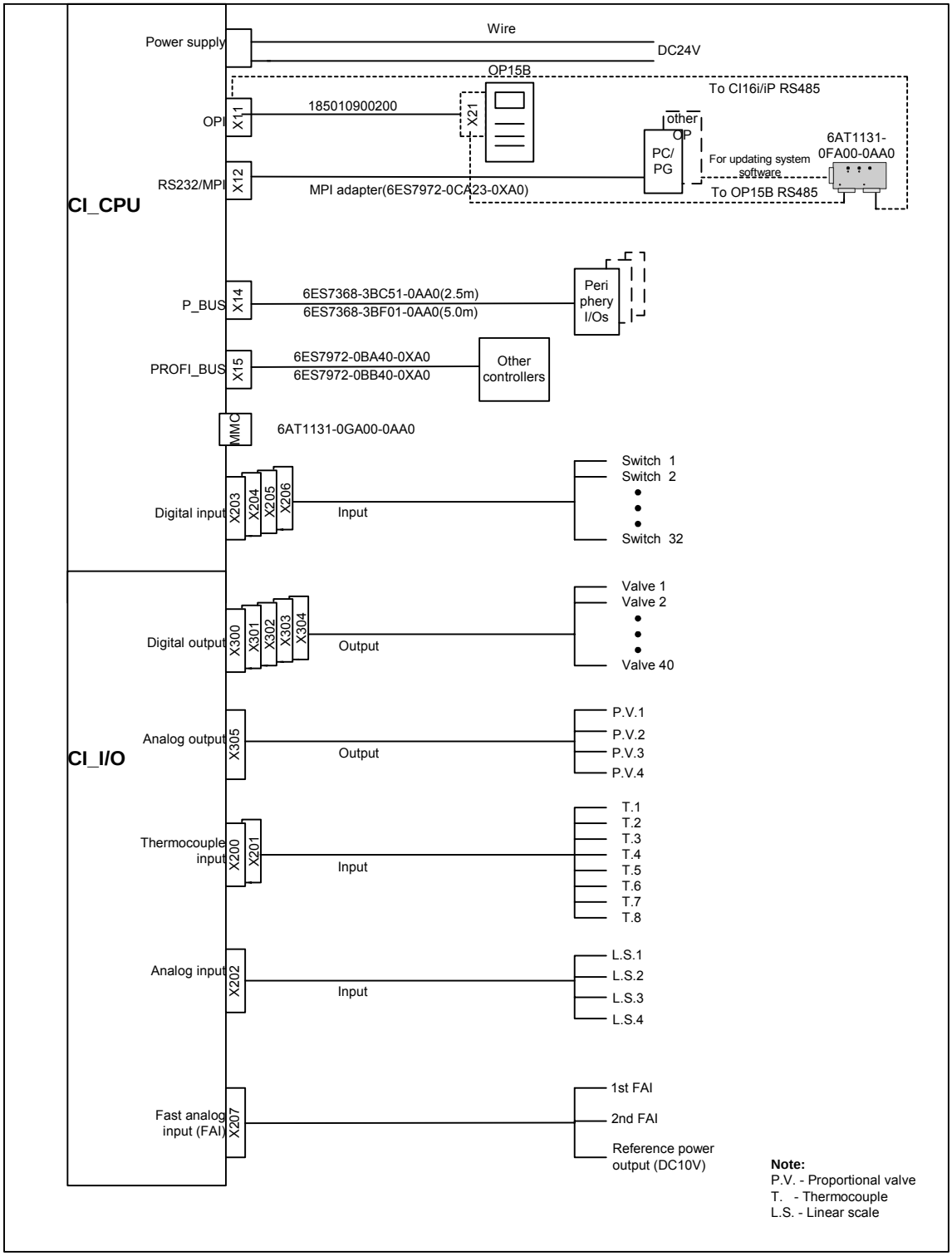
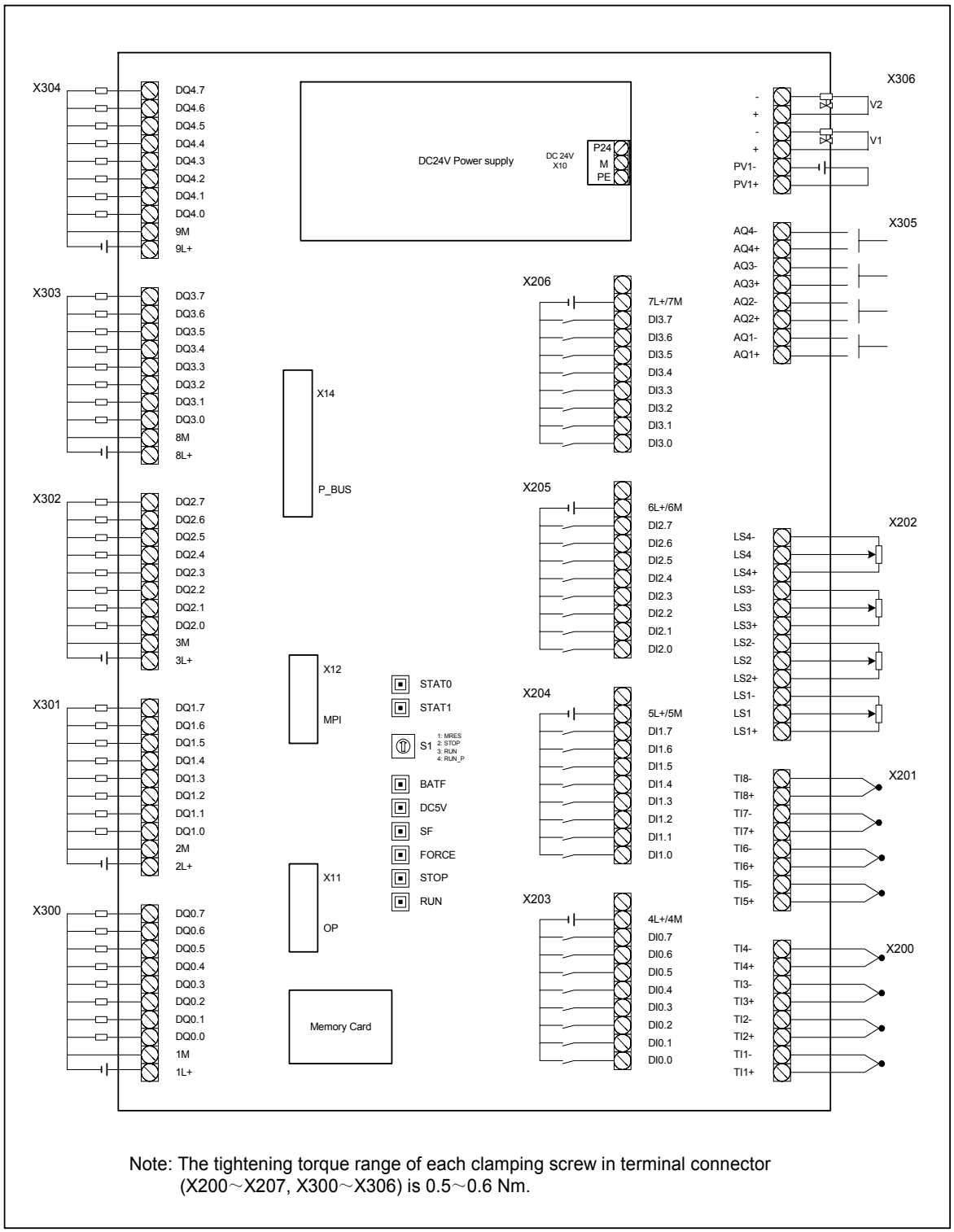


Fig. 2-6 Cable diagram for SIJECT 16i

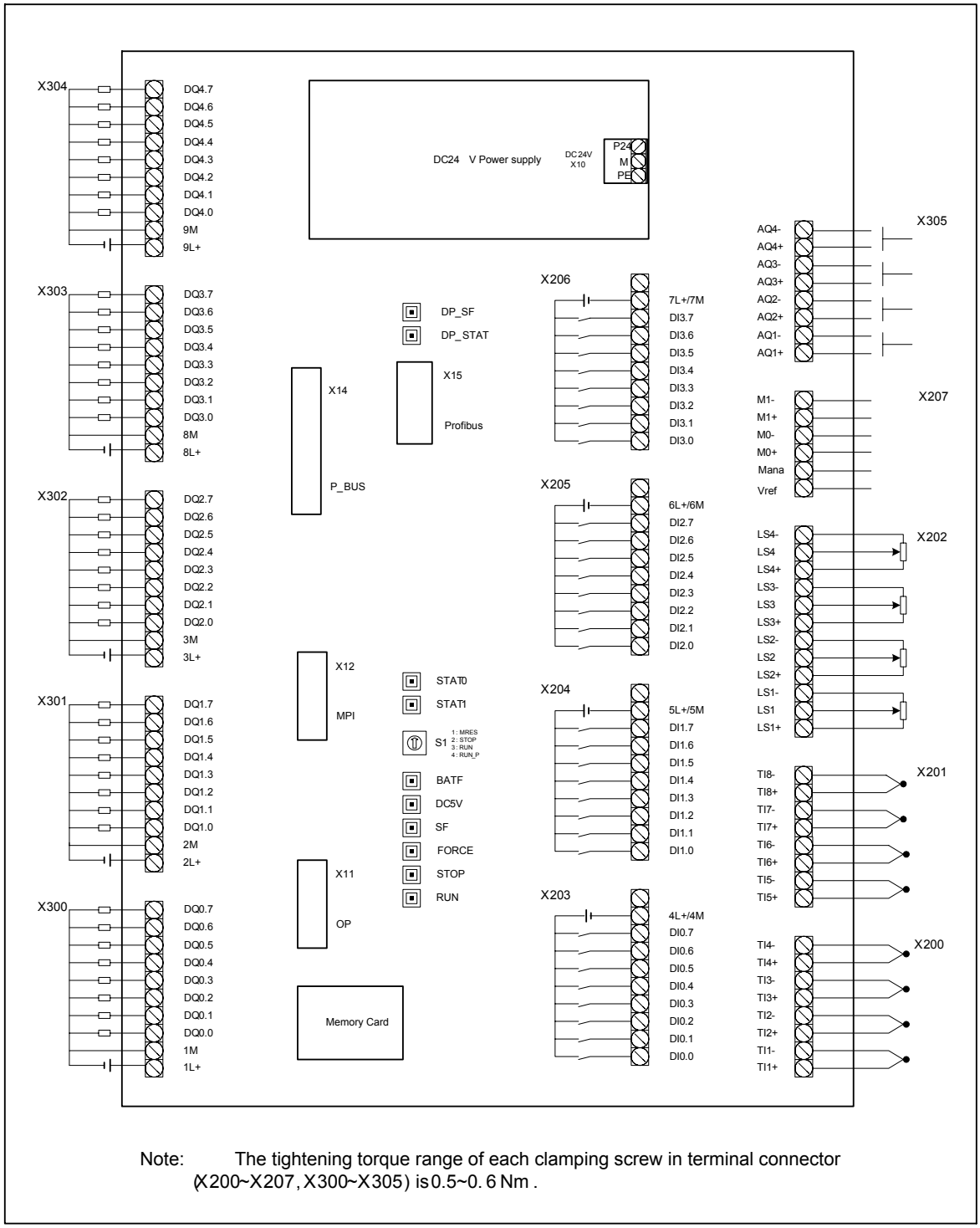


Note: The tightening torque range of each clamping screw in terminal connector (X200～X207, X300～X306) is 0.5～0.6 Nm.

Fig. 2-7 Connection Diagram for CI16i

Note:

This figure shows a connection of DI X203/X204/X205/X206 to the DC24- terminal and such connection is applicable for NPN proximity switch. For a connection to DC24+, see Fig. 2-8)



Note: The tightening torque range of each clamping screw in terminal connector (X200~X207, X300~X305) is 0.5~0.6 Nm.

Fig.2-8 Connection diagram for CI16iP

Note:

This figure shows a connection of DI X203/X204/X205/X206 to the DC24+ terminal and such connection is applicable for PNP proximity switch. For a connection to DC24-, see Fig. 2-7)

2.3 Connecting the Individual Components of CI

Connecting the Components

Please note the following:

Caution

Use only shielded cable and make sure that the shield is connected with the metal or metal plated connector casing on the control side.

The cable offered as accessories provides optimum protection against interference.

Proceed as follows to connect the individual components:

1. Connect the lines to the components as shown in Fig.2-7/2-8;
2. Fix the sub-D connector using screws.

2.3.1 Connecting the Operator Panel (X11)

Pin assignments for connector on CI side

Operator panel interface

Connector designation: X11
OP15B

Connector type: 9 – pin sub-D male connector

Table 2-1 Pin assignments of connector X11

X11		
Pin	Signal	Type
1	M	V
2	XBOOT	I
3	TXD+	O
4	RXD+	I
5	P24	V
6	XRES	I
7	RXD-	I
8	TXD-	O
9	M24	V

Pin assignments for connector on OP side

CI interface

Connector designation: X21
CI 16i/16iP

Connector type: 9 – pin sub-D female connector

Table 2-2 Pin assignments of connector X21

X21		
Pin	Signal	Type
1	M	V
2	XBOOT	I
3	RXD+	O
4	TXD+	I
5	P24	V
6	XRES	I
7	TXD-	I
8	RXD-	O
9	M24	V

2.3.2 Pin assignments of the RS232/MPI Interface (X12)

Pin assignments for connector

MPI (RS232) interface

Connector designation: X12
RS232 / MPI

Connector type: 9 – pin sub-D female connector

Table 2-3 Pin assignment of CI16i/iP connector X12

X12 (MPI)		
Pin	Signal	Type
1	RS232_RXD_DIAG	I
2	M24	M
3	MPI_P	V
4	RS232_TXD_DIAG	O
5	M	M
6	P5	V
7	P24	V
8	MPI_N	M
9	MPI_RTS	I

2.3.3 Pin assignments of the P_BUS Interface (X14)

Pin assignments for connector

P_BUS interface

Connector designation: X14
P_BUS

Connector type: 25 – pin sub-D female connector

Table 2-4 Pin assignments of connector X14

X14		
Pin	Signal	Type
1	RS_ALARM_N	I
2	IM_ADR0_N	O
3	IM_ADR1_N	O
4	IM_ADR2_N	O
5	M	V
6	KBUS_B_N	B
7	RS_OD_N	O
8	RS_DIDO_N	B
9	RS_CLK_N	O
10	RS_COM_N	O
11	RS_LST_N	O
12	RS_READY_N	I
13	No connection	N.C
14	RS_ALARM	I
15	IM_ALARM0	O
16	IM_ALARM1	O
17	IM_ALARM2	O
18	K<2>	O
19	KBUS_B	B
20	RS_OD	O
21	RS_DIDO	B
22	RS_CLK	O
23	RS_COM	O
24	RS_LAT	O
25	RS_READY	I

Notice

For CI 16i, this interface can not be used as K-BUS interface (SIMATIC K-BUS), because the internal pin 6 and 19 have no wire.

For CI 16iP, this interface is K_BUS integrated.

2.3.4 Pin assignments of the Profibus Interface (X15)[4]

Pin assignments for connector

Profibus interface

Connector designation: X15
Profibus

Connector type: 9 – pin sub-D female connector

Table 2-5 Pin assignments of connector X15

X15		
Pin	Signal	Type
1	No connection	N.C.
2	No connection	N.C.
3	DP_P	B
4	No connection	N.C.
5	M	V
6	P5	V
7	No connection	N.C.
8	DP_N	B
9	No connection	N.C.

[4] Profibus interface (X15) is only applicable for CI16iP.

2.3.5 Connecting the digital inputs (X203, X204, X205, X206)

Pin assignments for connector

Interface for digital inputs

Connector designation: X203, X204, X205, X206
Input

Connector type: 10-pin plug connector

Table 2-6 Pin assignments of connector

X203		
Pin	Name	Type
1	DI0.0	I
2	DI0.1	I
3	DI0.2	I
4	DI0.3	I
5	DI0.4	I
6	DI0.5	I
7	DI0.6	I
8	DI0.7	I
9	4L+/4M	V
10		
X204		
Pin	Name	Type
1	DI1.0	I
2	DI1.1	I
3	DI1.2	I
4	DI1.3	I
5	DI1.4	I
6	DI1.5	I
7	DI1.6	I
8	DI1.7	I
9	5L+/5M	V
10		
X205		
Pin	Name	Type
1	DI2.0	I
2	DI2.1	I
3	DI2.2	I
4	DI2.3	I
5	DI2.4	I
6	DI2.5	I
7	DI2.6	I
8	DI2.7	I
9	6L+/6M	V
10		

X206		
Pin	Name	Type
1	DI3.0	I
2	DI3.1	I
3	DI3.2	I
4	DI3.3	I
5	DI3.4	I
6	DI3.5	I
7	DI3.6	I
8	DI3.7	I
9	7L+/7M	V
10		

Input voltage

Signal 1	±15V~30V
Signal 0	0~±5V

Input current

Signal 1	6mA

Connecting sensors and actuators

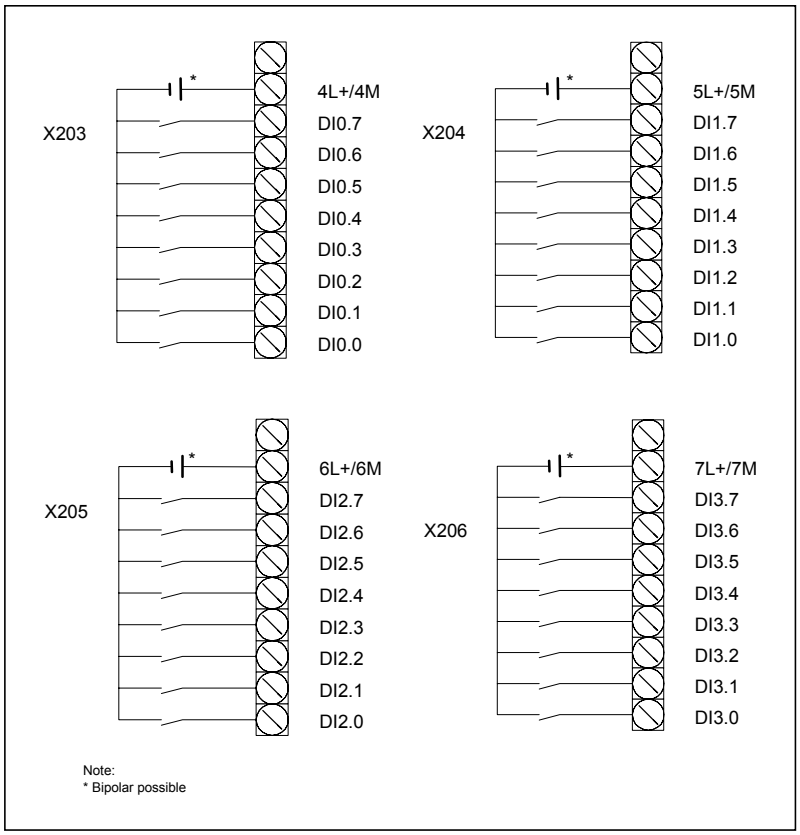


Fig.2-9 Connection of digital inputs

Signal description The digital inputs are assigned with the following signals:

DI 0.0	(spare)
DI 0.1	(spare)
DI 0.2	(spare)
DI 0.3	(spare)
DI 0.4	(spare)
DI 0.5	(spare)
DI 0.6	(spare)
DI 0.7	(spare)
DI 1.0	Safety door 2 (short-cut available)
DI 1.1	Rear safety door (short-cut available)
DI 1.2	Emergency stop (short-cut available)
DI 1.3	Carriage advance end
DI 1.4	Carriage retract end
DI 1.5	Ejector advance end
DI 1.6	Ejector retract end
DI 1.7	Mold lock end
DI 2.0	Mold adjustment advance end
DI 2.1	Mold adjustment retract end
DI 2.2	Core 1 in end / Screwing 1
DI 2.3	Core 1 out
DI 2.4	Core 2 in end / Screwing 2
DI 2.5	Core 2 out
DI 2.6	Injection door (short-cut available)
DI 2.7	Motor overload
DI 3.0	Safety door 1
DI 3.1	Lubrication error
DI 3.2	Mold adjustment photo-sensor
DI 3.3	Full-auto photo-sensor
DI 3.4	Robot
DI 3.5	Core 3 in end / Screwing 3
DI 3.6	Core 3 out
DI 3.7	Screw speed sensor

2.3.6 Connecting the thermocouples (X200, X201)

Pin assignments for connector

Interface for thermocouple

Connector designation: X200, X201
Input

Connector type: 8-pin male connector

Table 2-7 Pin assignments of connector

X200		
Pin	Name	Type
1	TI1+	V
2	TI1-	V
3	TI2+	V
4	TI2-	V
5	TI3+	V
6	TI3-	V
7	TI4+	V
8	TI4-	V
X201		
Pin	Name	Type
1	TI5+	V
2	TI5-	V
3	TI6+	V
4	TI6-	V
5	TI7+	V
6	TI7-	V
7	TI8+	V
8	TI8-	V

Sensor

Thermocouple	K/J
Temperature range	0~700 °C
Absolute accuracy	±3K

A/D-characteristics

Resolution	16Bit
Sampling rate	2s

Connecting sensor and actuators

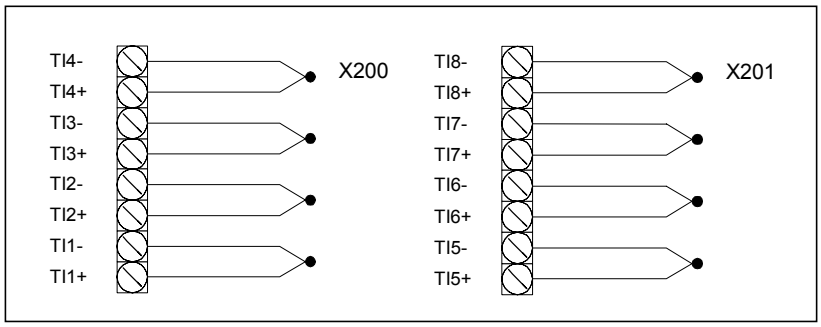


Fig. 2-10 Connection of the thermocouple

Signal description The analog inputs are assigned with the following signals:

TI1+, TI1-	Heater 1 (Nozzle)
TI2+, TI2-	Heater 2
TI3+, TI3-	Heater 3
TI4+, TI4-	Heater 4
TI5+, TI5-	Heater 5
TI6+, TI6-	Oil temperature
TI7+, TI7-	Heater 6
TI8+, TI8-	(spare)

2.3.7 Connecting the linear scale (X202)

Pin assignments for connector

Interface for linear scale

Connector designation: X202
Input

Connector type: 12-pin male connector

Table 2-8 Pin assignments of connector

X202		
Pin	Name	Type
1	LS1+	V
2	LS1	V
3	LS1-	V
4	LS2+	V
5	LS2	V
6	LS2-	V
7	LS3+	V
8	LS3	V
9	LS3-	V
10	LS4+	V
11	LS4	V
12	LS4-	V

Sensor

Type	Linear scale
Resistance value	1KΩ~10KΩ
Accuracy	±1%

A/D-characteristics

Resolution	12Bit
Sampling rate	2ms

Connecting sensor and actuators

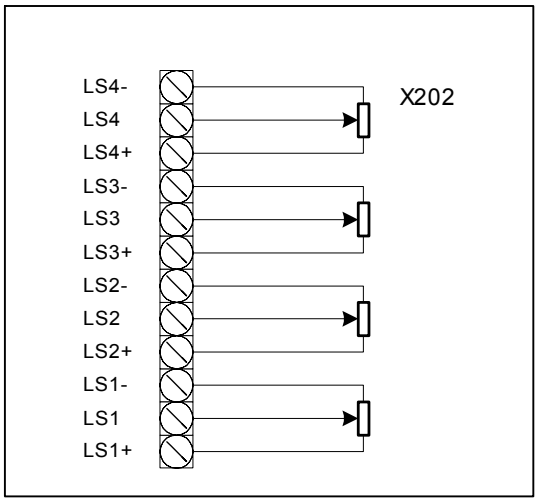


Fig.2-11 Connection of the linear scales

Signal description The analog inputs are assigned with the following signals:

LS1+, LS1, LS1-	linear scale 1 (0-10V): Mold
LS2+, LS2, LS2-	linear scale 2 (0-10V): Screw
LS3+, LS3, LS3-	linear scale 3 (0-10V): Ejector
LS4+, LS4, LS4-	linear scale 4 (0-10V): Carriage

Remarks 1:

DB1.DBB1290	Filter for linear scale analog_input_1	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** on the next page
DB1.DBB1291	Filter for linear scale analog_input_2	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** on the next page
DB1.DBB1292	Filter for linear scale analog_input_3	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** on the next page
DB1.DBB1293	Filter for linear scale analog_input_4	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** on the next page

DB1.DBW84	X202: AI1	Analog input linear scale 1 (0-10V): mold
DB1.DBW86	X202: AI2	Analog input linear scale 2 (0-10V): screw
DB1.DBW88	X202: AI3	Analog input linear scale 3 (0-10V): ejector
DB1.DBW90	X202: AI4	Analog input linear scale 4 (0-10V): carriage

Note: The software filters for linear scale analog inputs indicated above are valid from firmware release V1.14.

Remarks 2: A/D conversion time

Type	**Filter**	**Conversion time: ms 0V-10V**	**Conversion time: ms 10V-0V**
Linear scale AI 1	0	4	6
	1	5	7
	2	6	8
	3	7	9
	4	8	10
	5	10	12
	6	12	14
	7	13	16
	8	15	18
	9	19	21
	10	23	25
	11	28	30
	12	33	35
	13	40	45
	14	60	70
	15	120	130

Note: The conversion times indicated above are valid from CI16i hardware version C and CI16iP Step B hardware version B only.

2.3.8 Fast analog inputs (X207)[5]

Pin assignments for connector

Interface for fast analog input (FAI)

Connector designation: X207
Input

Connector type: 6-pin male connector

Table 2-9 Pin assignments of connector

X207		
Pin	Name	Type
1	V_{ref}	V
2	M_{analog}	V
3	M0+	V
4	M0-	V
5	M1+	V
6	M1-	V

A/D-characteristics

Resolution	14Bit
Polarity	Unipolar

Signal description

The Fast Analog Inputs are assigned with the following signals:

M0+, M0-	first channel FAI (0~10V)
M1+, M1-	second channel FAI (0~10V)
V_{ref}, M_{analog}	reference power output (DC 10V)

Connecting sensor and actuators

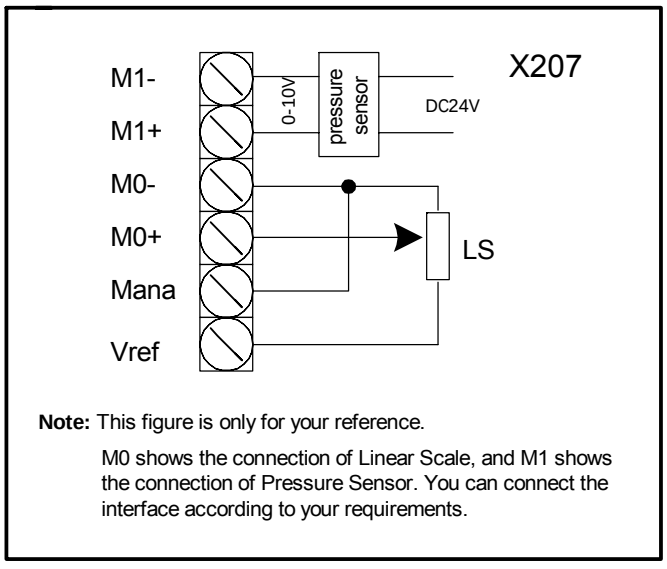


Fig.2-12 Connection of Fast Analog Inputs

[5] Fast analog inputs (X207) are only applicable for CI16iP.

Remarks 1:

DB1. DBB1226	Filter for analog_in_fast 0	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** on the next page
DB1.DBB1227	Filter for analog_in_fast 1	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** on the next page
DB1.DBW1230	X207: analog_in_fast 0	In Volts (0…10), process data to PLC
DB1.DBW1232	X207: analog_in_fast 1	In Volts (0…10), process data to PLC

Example:

If the second channel of Fast Analog Inputs is connected with Pressure Sensor, the actual value of Pressure Sensor can be read out in DB1.DBW1232, the correspondent software Filter can then be set in DB1.DBB1227, where 0 refers to disabling of Filter while 1 to 15 refer to enabling of different Filter characteristics. The Filter is intended for noise removal.

Remarks 2: A/D conversion time

Type	Filter	Conversion time: ms 0V-10V	Conversion time: ms 10V-0V
Fast AI 1	0	0	0
	1	2	2
	2	4	4
	3	6	6
	4	8	8
	5	10	10
	6	10	10
	7	12	12
	8	16	17
	9	18	18
	10	19	20
	11	33	34
	12	44	49
	13	52	53
	14	85	85
	15	166	168

2.3.9 Connecting the digital outputs (X300, X301, X302, X303, X304)

Pin assignments for connector

Interface for digital outputs

Connector designation: X300, X301, X302, X303, X304
Output

Connector type: 10-pin male connector

Table 2-10 Pin assignments of connector

X300		
Pin	Name	Type
1	1L+	V
2	1M	V
3	DQ0.0	I
4	DQ0.1	I
5	DQ0.2	I
6	DQ0.3	I
7	DQ0.4	I
8	DQ0.5	I
9	DQ0.6	I
10	DQ0.7	I
X301		
Pin	Name	Type
1	2L+	V
2	2M	V
3	DQ1.0	I
4	DQ1.1	I
5	DQ1.2	I
6	DQ1.3	I
7	DQ1.4	I
8	DQ1.5	I
9	DQ1.6	I
10	DQ1.7	I
X302		
Pin	Name	Type
1	3L+	V
2	3M	V
3	DQ2.0	I
4	DQ2.1	I
5	DQ2.2	I
6	DQ2.3	I
7	DQ2.4	I
8	DQ2.5	I
9	DQ2.6	I
10	DQ2.7	I

X303		
Pin	Name	Type
1	8L+	V
2	8M	V
3	DQ3.0	I
4	DQ3.1	I
5	DQ3.2	I
6	DQ3.3	I
7	DQ3.4	I
8	DQ3.5	I
9	DQ3.6	I
10	DQ3.7	I
X304		
Pin	Name	Type
1	9L+	V
2	9M	V
3	DQ4.0	I
4	DQ4.1	I
5	DQ4.2	I
6	DQ4.3	I
7	DQ4.4	I
8	DQ4.5	I
9	DQ4.6	I
10	DQ4.7	I

Voltage

Rated load voltage	24V
Max. load voltage	28.8V

Current

Rated load current	2A
Max. load current	2.4A
Short-circuit protection	Yes
Simultaneity factor	50%

Connecting sensor and actuators

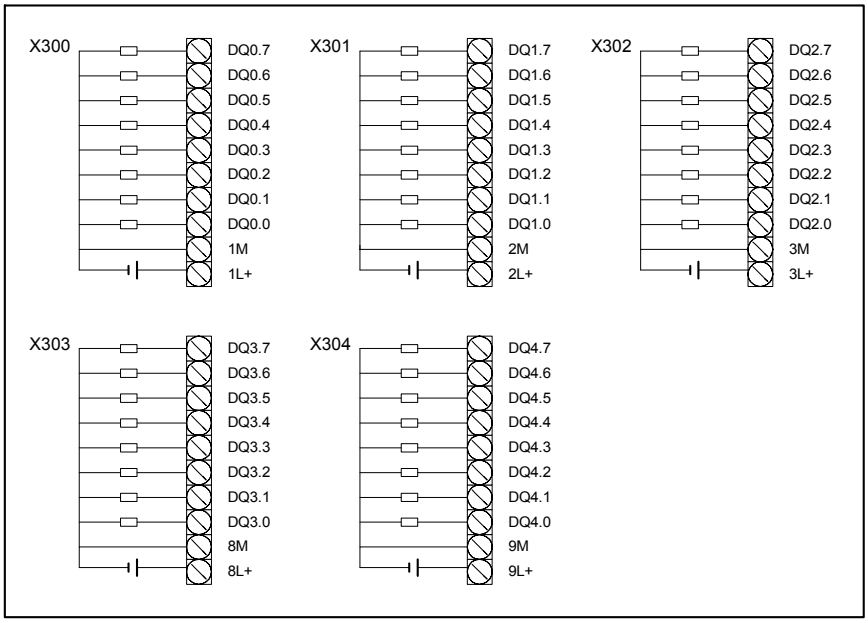


Fig.2-13 Connecting the digital outputs in SIJECT 16i

Signal description The digital outputs are assigned with the following signals:

DQ 0.0	Core 1 in
DQ 0.1	Core 1 out
DQ 0.2	Core 2 in
DQ 0.3	Core 2 out
DQ 0.4	Carriage advance
DQ 0.5	Carriage retract
DQ 0.6	Charging
DQ 0.7	Injection
DQ 1.0	Mold close
DQ 1.1	Mold close fast
DQ 1.2	Mold open
DQ 1.3	Mold open fast
DQ 1.4	Mold adjustment advance
DQ 1.5	Mold adjustment retract
DQ 1.6	Ejector advance
DQ 1.7	Ejector retract
DQ 2.0	Suck back
DQ 2.1	Pump 2
DQ 2.2	Zero back pressure
DQ 2.3	Robot
DQ 2.4	Core 3 in
DQ 2.5	Core 3 out
DQ 2.6	Air blow 1
DQ 2.7	Air blow 2

DQ 3.0	Heater 1 (nozzle)
DQ 3.1	Heater 2
DQ 3.2	Heater 3
DQ 3.3	Heater 4
DQ 3.4	Heater 5
DQ 3.5	(spare)
DQ 3.6	(spare)
DQ 3.7	(spare)
DQ 4.0	Motor star start
DQ 4.1	Motor triangle start
DQ 4.2	Motor start
DQ 4.3	Alarm light
DQ 4.4	Lubrication pump
DQ 4.5	Alarm buzzer
DQ 4.6	(spare)
DQ 4.7	(spare)

Notice

The 24VDC power supply should meet the requirements of the safe separation in accordance with DIN EN 50178.

The terminal M in the 24VDC power supply for the digital output (Signals 1M, 2M, 3M, 8M and 9M) are to be earthed additionally

Danger

The positive terminal of digital outlet lines (terminal $1L^+$ - $3L^+$, $8L^+$, $9L^+$) must be protected through a 10A fuse (See Fig.2-16).

The connection from 24VDC power supply to the line L^+ and M may not be exchanged, otherwise it can bring about a destruction in the CI board!

2.3.10 Connecting the analog outputs (X305)

Pin assignments for connector

Interface for analog outputs

Connector designation: X305
Output
Connector type: 8-pin male connector

Table 2-11 Pin assignments of connector

X305		
Pin	Name	Type
1	AQ1+	V
2	AQ1-	V
3	AQ2+	V
4	AQ2-	V
5	AQ3+	V
6	AQ3-	V
7	AQ4+	V
8	AQ4-	V

Output characteristics

Voltage range	-10V~+10V
Max. output current	±5mA
Gain error	±1%
Offset error	±100mV
Resolution	12Bit

Connecting sensor and actuators

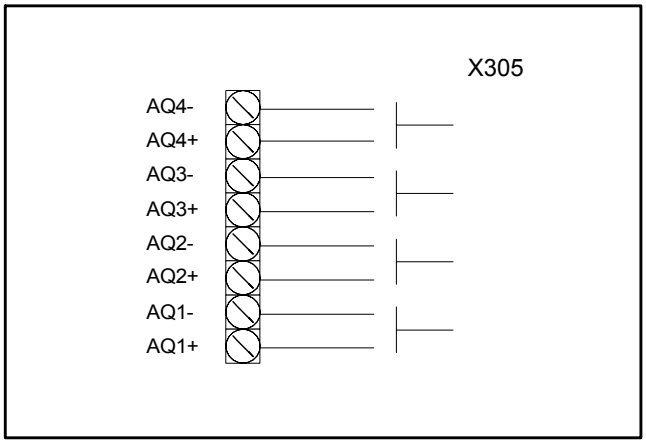


Fig. 2-14 Connecting the analog outputs

Signal description The analog outputs are assigned with the following signals:

AQ1+, AQ1-: Pressure valve (0-140bar)
AQ2+, AQ2-: Flow valve (0-100%)
AQ3+, AQ3-: Back pressure valve (0-140bar)
AQ4+, AQ4-: 4th proportional valve

2.3.11 Connecting the proportional valve current output (X306)[6]

Pin assignments for connector

Interface for proportional valve current output

Connector designation: X306
Output
Connector type: 6-pin male connector

Table 2-12 Pin assignments of connector

X306		
Pin	Name	Type
1	PV1+	V
2	PV1-	V
3	V1+	V
4	V1-	V
5	V2+	V
6	V2-	V

Output characteristics

Voltage range	+24V~38V
Current output	0.75~1.4A
Resolution	12 Bit

Notice

The output current for proportional valve depends on the inner resistance of valve and the external supplied DC power voltage. For instance, if the inner resistance of valve is 20Ohm, the supplied voltage is 24V; then the maximum output current for valve is 1.2A. The output current for other type valve should comply with Ohm's Law.

Connecting sensor and actuators

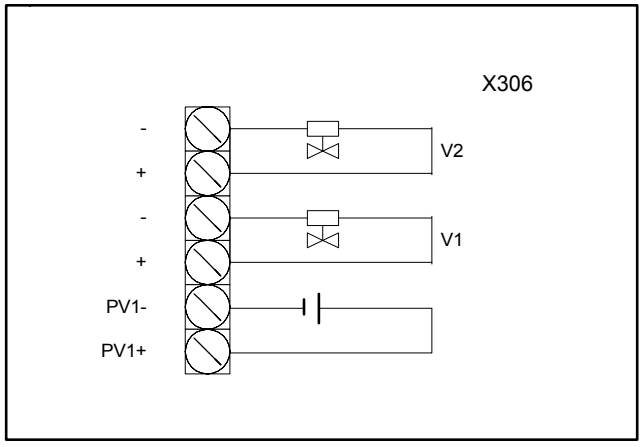


Fig. 2-15 Connecting the proportional valve current output

[6] The interface for proportional valve current output (X306) is only applicable for CI16i.

Signal description

The proportional valve current outputs are assigned with the following signals:

V1:	Proportional pressure valve
V2:	Proportional flow valve

2.4 Power Supply

Screw-terminal block

For SIJECT 16i system, DC24V power supply unit required for supplying CI and OP is wired to screw-terminal block and should be from an isolated secondary circuit.

The minimum cross section of the wire is 0.75m^2.

Terminal assignments

Table 2-13 Terminal assignments of terminal board

Terminal		
1	P24	DC24V+
2	M	DC24V-
3	PE	Protective earth

Characteristics of the load power supply

Table 2-14 Input specification

Parameters	Min.	Max.	Units
Rated input voltage	20.4	28.8	V
Fuse	On board fusing		
Ripple	Input filter		

Operator panel

The operator panels does not have separate power supply terminals. It is supplied via the signal cable from the CI.

Digital input/output

The digital inputs/outputs require an external DC24V switch power.

Proportional valve

The proportional valves need a separate switch power. It can be chosen in accordance with the type of proportional valve.

Caution

Power supply cable and signal cable should be seperated, i.e., linear scale and thermocouple signal cable can not be assigned to the same conduit with power supply cable.

Notice

The 24VDC power supply should meet the requirements of the safe separation in accordance with DIN EN 50178.

The terminal M in the 24VDC power supply for the digital output (Signals 1M –3M, 8M, 9M) are to be earthed additionally.

2.5 Grounding

Grounding Connections

The following grounding connections must be implemented:

- OP15B
- CI16i/iP

The grounding connection for the OP must be taken into account when installing the machine.

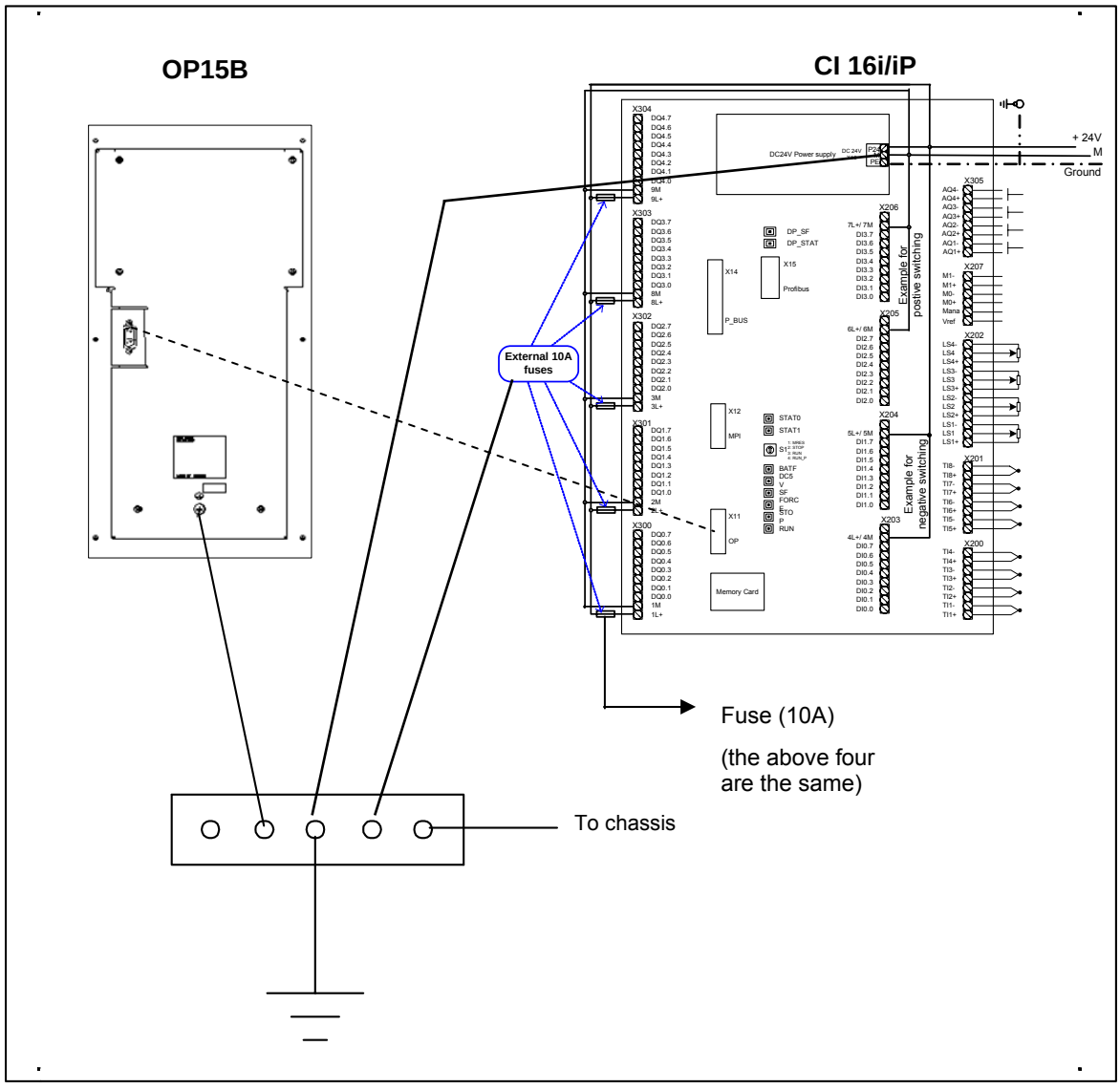


Fig.2-16 Grounding diagram for OP and CI

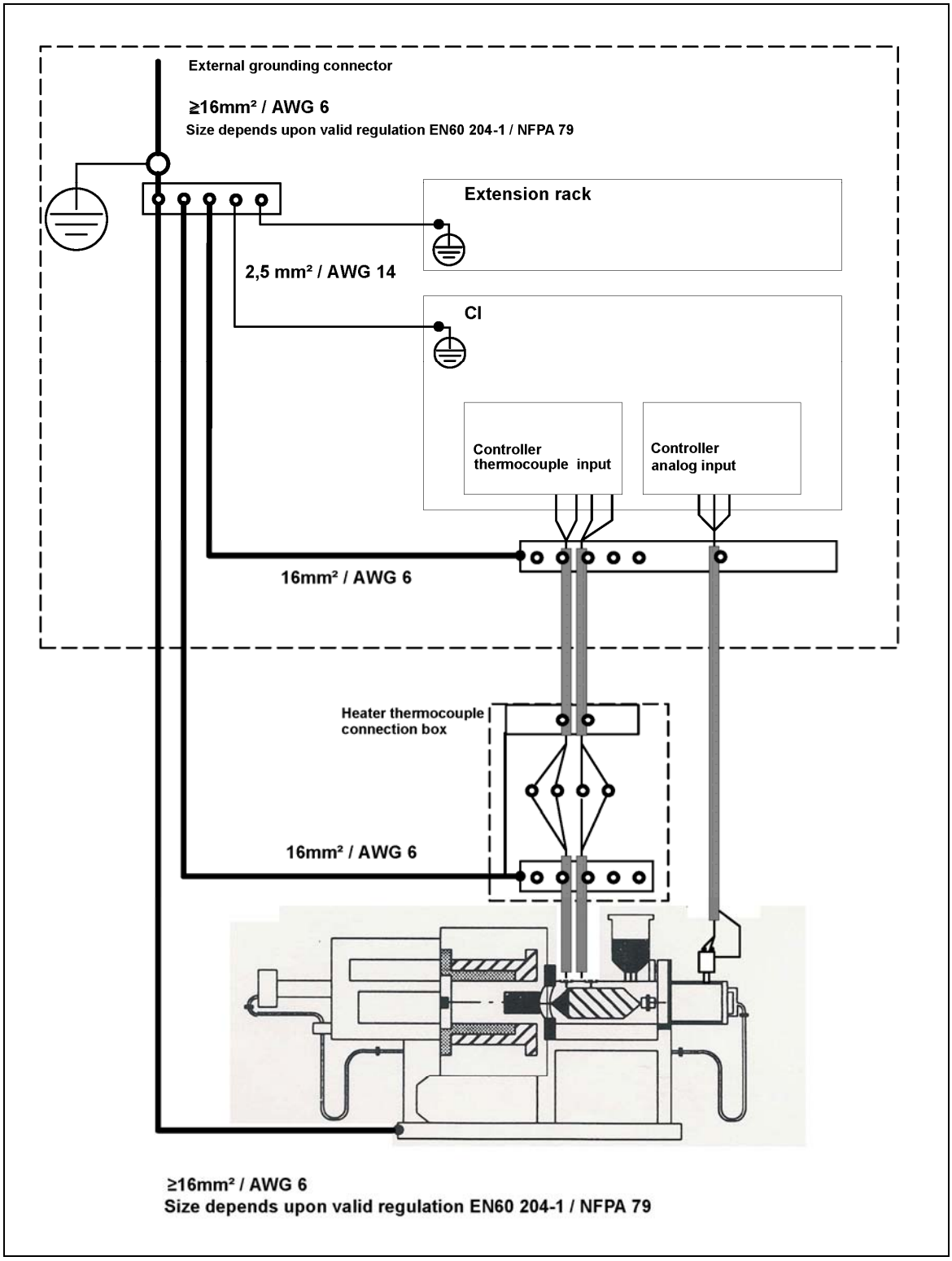

External grounding connector
≥16mm² / AWG 6
Size depends upon valid regulation EN60 204-1 / NFPA 79
Extension rack
2,5 mm² / AWG 14
CI
Controller thermocouple input
Controller analog input
16mm² / AWG 6
Heater thermocouple connection box
16mm² / AWG 6
≥16mm² / AWG 6
Size depends upon valid regulation EN60 204-1 / NFPA 79

Fig.2-17 Connection diagram (SIJECT System with the machine)

To ensure the normal operation of equipment, good grounding is required. Users are recommended to take following actions (according to GB/T5226.1-1996, eqv IEC204-1:1992):

1. The grounding wire should be Yellow/Green wire with cross section of 2.5 mm^2;
2. Linear scale and both sides of the shield of thermocouple signal wire must be grounded well on the injection molding machine;
3. Metal sheet embedded underground can be used as earth wire. Water pipe or metal frame of building which are grounded well can also be used as earth wire;
4. To ensure the reliability of the grounding, copper lead should be welded with earth wire.

Danger

The grounding wiring must be finished prior to connecting the power supply!

2.6 LEDs and Mode selector S1

Error and status LEDs

There are 10 LEDs on the front panel of the CI.

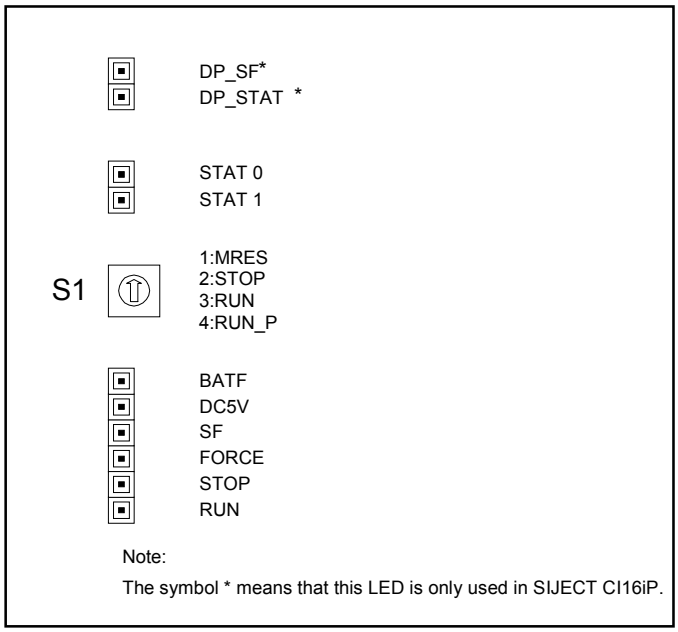


Fig. 2-18 Position of LEDs and mode selector S1

Table 2-15 Meaning of LEDs

LED	Meaning	Description	Remarks
DP_SF (red)	System Fault	Lights up if system is fault.	For CI16iP
DP_STAT (green)	System Normal	Lights up if system works normally.	For CI16iP
STAT0 (green)	CI Normal	Flashes at 1 second interval if CI is normal.	
STAT1 (red)	CI Fault	Lights up if CI is fault.	
BATF (red)	Battery Fault	Lights up if the battery is defective or not inserted.	
DC5V (green)	Power Supply Error	The LED will be bright all the time if the DC 5V circuit is normal.	Check DC5V circuit.

LED	Meaning	Description	Remarks
SF (red)	System Error/Fault	LED flashes when there is: • Hardware faults • Firmware errors • Programming errors • Parameter assignment errors • Arithmetic errors • Timer errors • Defective memory card • Battery failure or no backup on power on • I/O fault/error (external I/O only)	You must use a programming device and read out the contents of the diagnostics buffer to determine the exact nature of the error/fault.
FORCE (yellow)	Force job	Lights up if a force job is active	
STOP (yellow)	STOP Mode	Lights up when CPU is not scanning the user program. Flashes at 1 second interval when CPU requests a memory reset.	
RUN (green)	RUN Mode	Flashes at 2Hz during CPU restart: • At least continue 3 seconds; however, CPU restart can be shorter after CPU restart • During the CPU restart, the STOP LED always lights up; when the STOP LED goes dark, the outputs are enabled.	

Mode selector S1 Mode selector S1 has 4 different positions. It depends on the Gray code.

Table 2-16 Mode selector S1

	GRAY 2	GRAY 1
MRES	0	1
STOP	0	0
RUN	1	0
RUN_P	1	1

Meanings

Table 2-17 Meaning of Mode selector S1

Position	Designation	Meaning
MRES	Memory Reset	Momentary-contact position of the mode selector for resetting the CPU memory. A special sequence must be observed when resetting the CPU memory with the mode selector (refer to section 3.5).
STOP	STOP Mode	The CPU does not scan user programs. Programs can: • Be read out of the CPU with a programming device (CPU→PG) • Be loaded into the CPU with a programming device (PG→CPU)
RUN*	**RUN Mode**	**For internal use only!** **The PLC stops any communication in this mode. Don't use this mode on customer side.**
RUN-P	RUN-Program Mode	The CPU scans the user program. Programs can: • Be read out of the CPU with a programming device (CPU→PG) • Be loaded into the CPU with a programming device (PG→CPU)

* **Note:** This mode is inapplicable to CI16iP. If in CI16iP, the Mode Selector S1 is set in RUN position, CPU will NOT work in order.

3 Start-up

3.1 General

Start-up requirements

The following is required:

- **User Manual:** Operation Manual SIJECT 16i
- **PC/PG:** Data exchange with control system
  - With MPI adapter and SIMATIC S7-300 programming tool: for down-/upload PLC-program for SIJECT16i;
- **MMC card:** can be used to store customer specific picture (CSP), recipe data and PLC application program. Detailed operation steps can be found in Operation Manual section 3.1.10. The PLC / menus / CSP can be saved/loaded to/from MMC card.

The mechanical and electrical installation of the equipment must be completed.

Notice

For installation, refer to the installation description provided in the Chapter Two of this manual.

The control system with its components boots without errors.

Start-up Sequence

A possible start-up sequence for the SIJECT 16i is as follows:

1. Check whether the CI boots
2. Check the diverse versions of PLC, CI and OP
3. Check the I/Os via display and the LEDs in CI
4. Set recipe data
5. Optimize the data
6. Save the data

Warning

For SIJECT CI 16iP, PLC module can not run normally when Mode Selector S1 is indicated to **RUN** mode at power-on. Therefore, make sure that S1 is not at **RUN** position when electrifying the system.

3.1.1 Access levels

User class

The SIJECT 16i implements a user class concept to enable certain data areas. The user classes have protection level 1 and 2.

User class 1

When setting the parameters via operator panel, the screen will display “Enter Password, XXXX”. User should enter the password of class 1. Factory setting for the password class 1 is **1111**. Then push the Enter key to confirm the entry.

After Switch-On of the control system, if there is no action for 5 minutes, the system will require password entry for the second time when you operate again.

User class 2

User class 2 requires the **password 2** (2000) on the **Service** screen. It is set up so as to avoid the accidental modification of function parameters by the operator. They are the most important parameters with the influence on the machine function. Only the service engineer has the accessible right.

Caution

When changing the recipe parameters, every machine movement must be stopped!

Notice:

Protection level 1 and 2 are only for OP15B (not for SIMATIC OP’s).

3.1.2 Structure of recipe data

Definition

Recipe data is consisted of diverse values with different units. Usually, one set of recipe data contains the following parameters:

- Hydraulic pressure P
- Hydraulic flow F
- Movement position S
- Set time and actual time T
- Set temperature value and actual temperature value
- Counter number
- Mode selection number

User class

To set and change the general recipe data, user class 1 must be activated. Start-up of the service parameters generally requires user class 2.

Unit

The physical units of the recipe data are set as follows:

Table 3-1 Recipe data unit

Parameter	Unit
Pressure P	bar
Flow F	%
Position S	mm
Timer T	second
Temperature	°C
Counter	No unit
Mode selection	No unit

Standard data

For convenience of the user, we deliver the controller with the integrated PLC-program. You should set and adjust the recipe data in compliance with the program.

No default recipe data exist in the control system with the version of the control supplied unless otherwise programmed.

3.1.3 Handling of recipe data

Handling methods

Display:

Input via keys and MMC card.

Making back-up copies and saving to MMC card

Loading the recipe data from MMC card

Alarm when loading recipe data

If the process of loading recipe data from MMC card has errors, there will be system message to inform the error.

User can execute related operation according to the alarm.

Notice

You should press **Enter key** to confirm your setting whenever any parameter has been changed.

3.1.4 Recipe data saving

Internal data saving

The recipe data on the screen can be automatically saved in the memory during operation. After power on for the next time, the saved recipe data will be recovered.

To avoid loss of the setting parameters, the recipe data should be saved internally before the control system is switched off. In the permanent memory, max.30 sets of recipe data with the relevant mould number can be saved.

It is recommended to carry out internal data saving whenever important data changes have been made.

Saving data internally:

Use the Save/Load key to enter save screen, and use Selection key to select “system”, then input recipe number (from 1 to 30)[7], then press Enter key to confirm your entry. Lastly, press soft key F3 to load the recipe data.

External data saving

Apart from internal data saving, the recipe data can also be saved externally, i.e. in MMC card. Max.50 sets of recipe data with the relevant mould number can be saved.

External data saving should be performed whenever series start-up has to be done.

Saving data externally:

- Plug the MMC card in the slot after the controller is switched off;
- Use the Save/Load key to open the save/load screen;
- Use Selection key to select MMC card;
- Enter the value with the recipe number(in the range from 1 to 50);
- Press Enter key to confirm your entry;
- Press soft key F3 to do the saving. The system will display a message when saving operation is finished.
- Press to acknowledge it.

[7] If the number exceeds 30, the data can only be displayed and can not be saved. The screen will give message during operation.

3.2 Switching on and Booting the control system

Procedure

Visual inspect the system for:

- proper mechanical installation with tight electrical connections;
- power supply connection;
- connection for shielding and grounding.

Turn on the control system.

Notice

If memory and **Mode selector S1** are set correctly, the control system boots.

Mode selector S1 (hardware)

The CI is provided with the **Mode selector** to assist start-up of the control system. This switch can be operated by a screwdriver.

Table 3-2 Mode selector setting

Position	Status	Meaning
1	MRES	Reset CPU memory
2	STOP	STOP mode
3	RUN	RUN mode
4	RUN_P	RUN PROGRAM mode

When starting up the control system, Mode Selector S1 should be at **RUN_P** position. **Do not use RUN mode! RUN mode is only for internal debugging. The PLC stops any communication in RUN mode.**

The position **RUN_P** must be held during the down-/uploading PLC-program.

Booting the control system

When the control system is turned on for the first time, an initial state of the control system is established automatically. All memory areas are initialized and loaded with previously-stored default data.

This initial state is the precondition for error-free start-up of the control system.

3.2.1 Boot messages

Displays on the screen

When the control system is booting, the booting process will be displayed on the screen as follows:

1. At first the customer specific picture is displayed for 3 seconds;
2. Then on the screen shows the “Information” menu for 3 seconds;
3. After this the “Monitoring” screen will be opened.

LED signal

If the control system has booted without errors, the green **DC5V** LED will light up and the green **STAT1** LED (in CI 16i) flash at 1 second interval or the green **DP_STAT** LED (in CI 16iP) lights up.

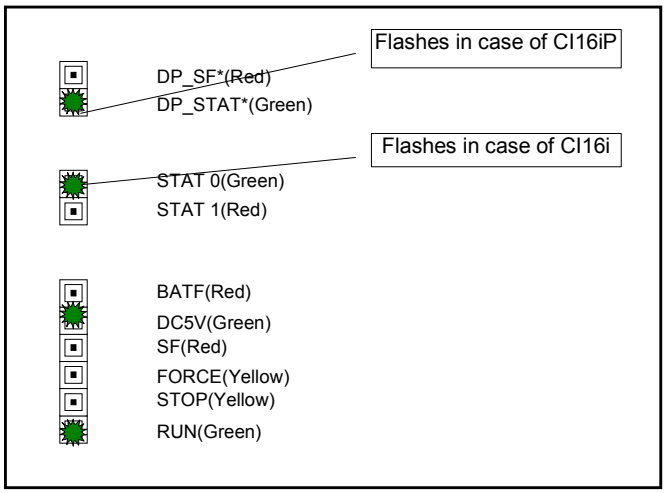


Fig. 3-1 LED signal

For any other case you can refer to Table 2-15 in section 2.6.

You can also check the booting status on the **Information screen 2** as follows:

1. Use the Information key to open the Information screen 1
2. Push the PgDn key to call the Information screen 2
3. Check the messages on the screen:
   - PLC Switch:
   - PLC Startup:
   - PLC LifeCnt:
   - OP Communication:
   - CI EEPROM:
   - CI type

Contrast adjustment

In case that the display contrast doesn't match with the environment, you can adjust the contrast using the Function key.

Steps are as follows:

1. Press Function key to enter function picture**;**
2. Press softkey F3 to increase the contrast, and press softkey F4 to decrease contrast.

In addition, screen back light can also be set on this screen. If selected, then back light will be turned off automatically if there is no key pressed during 3 minutes; otherwise, back light will be turned off if there is no key pressed during 10 minutes.

Notice:

For the first operation, password class 1 (1111) should be entered.

Display sequence

Display screen 1: Customer specific picture

Fig. 3-2 Customer Specific Picture (CSP)

This picture is presented for 3 seconds. SIEMENS can make every specific picture according to the requirements of users.

Menu 2: Information screen 1

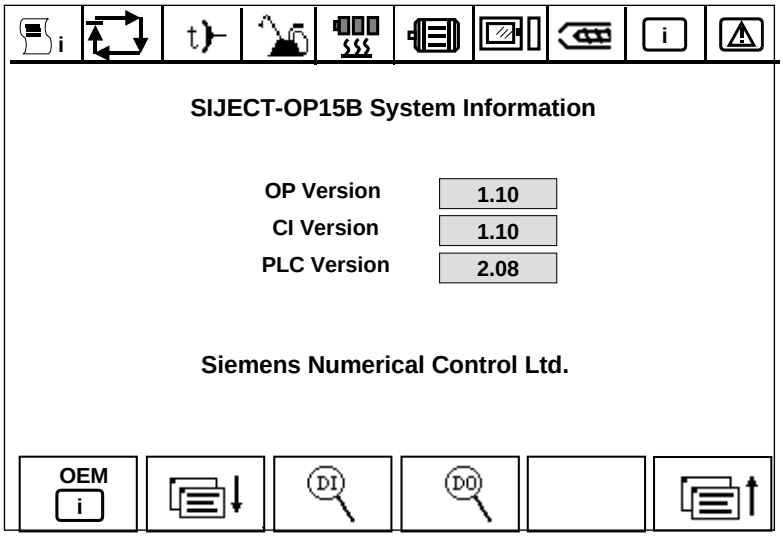


Fig 3-3 Information screen 1

This picture will last 3 seconds.

Menu 3: Monitoring screen

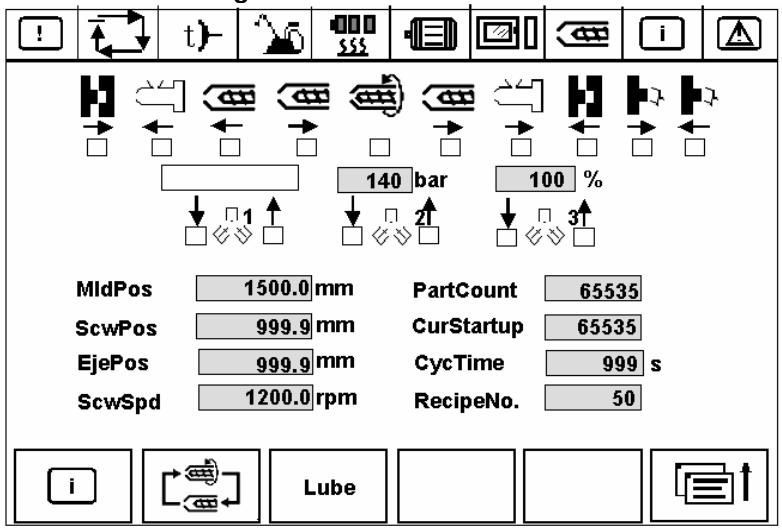


Fig.3-4 Monitoring screen

This screen is the main picture of the system. This screen is always displaying until it is switched to the desired menu by pressing the other keys.

The operator can supervise the production process with reference to the parameters displayed on the screen. The current operation state is displayed in the status field. In case of malfunction, the alarm symbol will flash and user can enter alarm picture to check the alarm.

Notice:

For the meaning of each indicator on this screen, please refer to Chapter Two of Operation Manual for details.

3.2.2 Alarm

General

Up to 32 alarms can be displayed in SIJECT16i. The active alarm will pop up on the Alarm screen.

Alarm list

You can see the alarm text and remedy in following table:

Table 3-3 Alarm list

Alarm Name	Description / Remedy
AdjLimit	Mold adjustment is over limit
	1. Check the limit switch
	2. Readjust the mold
AutAdjFin	Auto-mold adjustment finished.
	1. Manual operation is permitted.
AdjSenErr	Photo-sensor for mold adjustment is invalid
	1. Photo-sensor is invalid in mold adjustment advance/retract.
	2. Check if the photo-sensor is damaged.
TmpLimit	Temperature is not in permitted range.
	1. Check the heating status of barrel.
	2. Check if the heating LED lights up.
OilTmp	Oil temperature is out of the range.
	1. Check the oil temperature.
	2. Check the oil thermocouple.
MotLoad	Hydraulic pump is overload.
	1. Check the hydraulic system.
	2. Check the circuit breaker.
MldSg	Safety door is not closed.
	1. Check the limit switch of safety door.
	2. Close the safety door.
PartCount	Product counter is full.
	1. Enter a big value.
	2. Set the part counter to zero.
TmCyc	Actual cycle time surpasses the setting.
	1. One step occupies too much time during the cycle.
	2. Cycle time is too short.
CycSenCov	Cycle photo-sensor is covered.
	1. The photo-sensor is damaged.
	2. The photo-sensor is covered by the workpiece.
CycSenErr	Cycle photo-sensor has error.
	1. The photo-sensor is damaged.

Alarm Name	Description / Remedy
MldOpnErr	Can not open mold to end position.
	1. Check the limit switch. 2.Adjust the position/pressure/flow and tolerance.
TmMldLck	Mold can not be locked.
	1. Clear the obstacle in the mold. 2. Adjust pressure/flow.
EjeNotBck	Ejector is not in the back position.
	1. Check if the ejector is at end limit switch. 2. Check pressure/flow.
CorNotBck	Cores are not back to the start position.
	1. Check the limit switch for core in/out.
TmCha	Charging is not finished.
	1. No material in hopper. 2. Check if the backpressure is too high.
TmMldPro	Low-pressure mold protection time is up.
	1. Clear the obstacle in the mold. 2. Extend the mold protection time.
InjSg	Injection safety door is not closed.
	1. Close the safety door when injection. 2. Check the switch of safety door.
LubeErr	Lubrication oil level is too low.
	1. Check the setting of lubrication.
Alarm 20	Waiting for robot.
	1. Waiting for robot downward.
RobErr	Robot is failed.
	1. Check the sensor of robot. 2. Check the setting of robot.
TcInj	Injection time has been exceeded.
	1. Check the material. 2. Check the nozzle.
ScwSenErr	Screw speed is abnormal.
	1. Check if there is any material in the barrel. 2.
LS PS Err	Power supply of linear scale is failure.
	1 2
TC1 Fault	Thermocouple of channel 1 (nozzle) is broken.
	1 2

Alarm Name	Description / Remedy
TC2 Fault	Thermocouple of channel 2 (heater) is broken.
	1 2
TC3 Fault	Thermocouple of channel 3 (heater) is broken.
	1 2
TC4 Fault	Thermocouple of channel 4 (heater) is broken.
	1 2
TC5 Fault	Thermocouple of channel 5 (heater) is broken.
	1 2
TC6 Fault	Thermocouple of channel 6 (oil) is broken.
	1
	2
Alarm 31	
Alarm 32	

3.3 Checking I/Os

Overview

After booting without any error, the control system can be put into operation. Check I/Os status prior to setting the parameters, which can avoid the unnecessary troubleshooting.

Operating sequences

Press Information Key to enter information screen.
Then press softkey F3 or F4 to check the actual status of digital input/output.

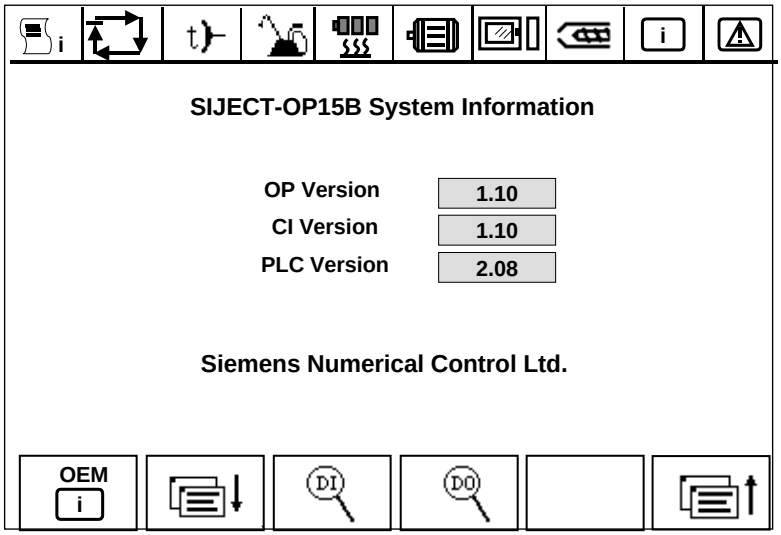


Fig. 3-5 Information Screen 1

Then, press softkey F3 to enter DI screen (digital input)：

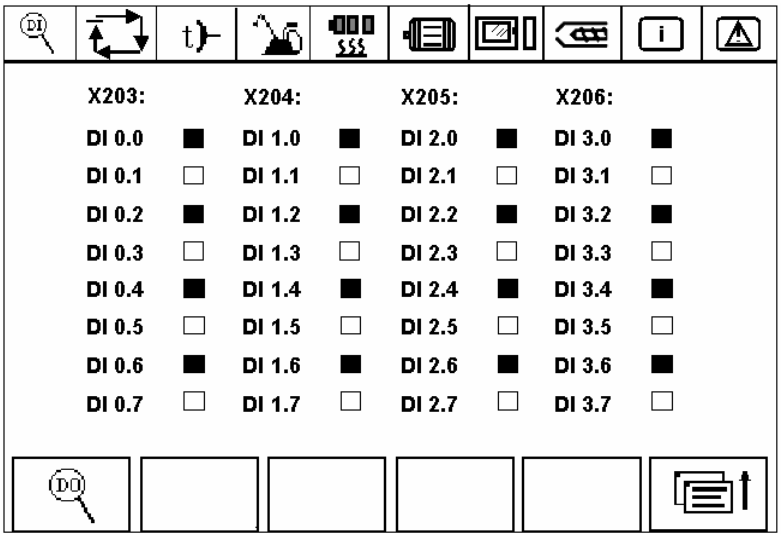


Fig. 3-6 Information screen 1.2 --- DI

Use current parameters to check the LED status.

Press different button in manual mode to observe the changing status.

On information screen 1 (Fig. 3-5 Information Screen 1), press softkey F4 to enter DO screen (digital output); or, on information screen 1.2 (Fig. 3-6 Information Screen 1.2 --- DI), press softkey F1 to enter DO screen.

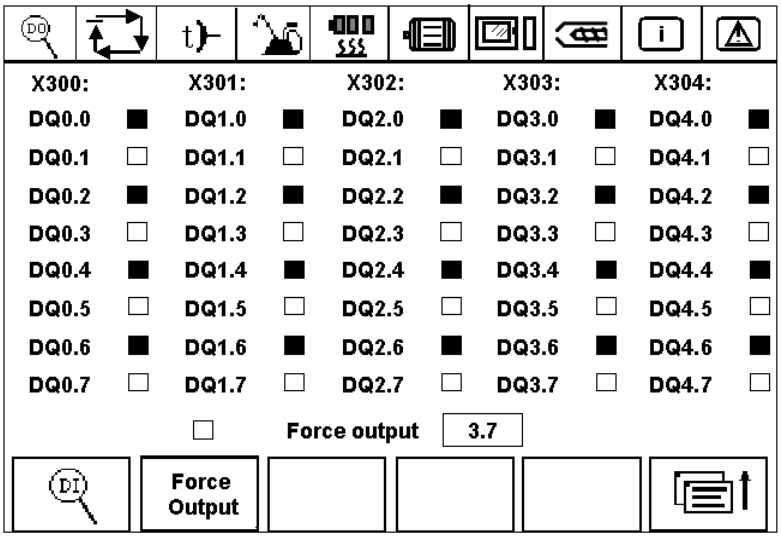


Fig. 3-7 Information Screen 1.3 --- DO

Use current parameters to check the LED status.

Press different button in manual mode to observe the changing status.

On Fig. 3-7 Information Screen 1.3 --- DO, “Force Output” is for the force output of certain point. For example, enter 3.4 and press F2 “Force Output”, then the box will backlight. At this moment, DQ3.4 is backlighting on the screen, and in the system this point will have output and LED lights up.

3.4 Setting important parameters

In this chapter, we will give a description of how OEMs set the most important parameters for injection molding machine. It contains how to select language and service, how to set each parameter, such as linear scale, password, saving mode, start-up of proportional valve, combination of pumps, lubrication, temperature and ramp.

Warning

Never pull out or plug in the connector while the equipment is live!
Otherwise this can result in the damage of data loss or control failure.

Caution

Password of level 2 (2000) must be entered prior to parameter setting!
During operation, do not transfer the parameter!

3.4.1 Language selection

General

It is very important for operators to find the desired menus as soon as possible. As the first step you should select the appropriate language. You can select the language on this screen.

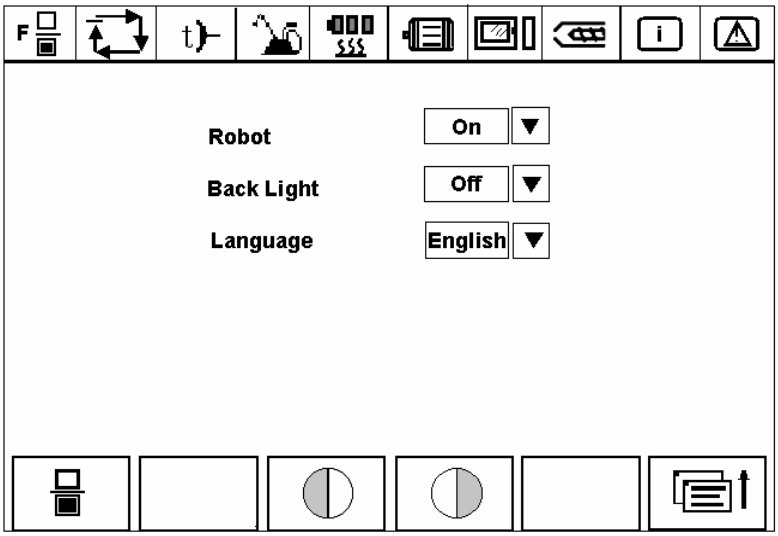


Fig. 3-8 Function Screen

Notice:

For SIJECT OP15B FV1, English, Chinese, Turkish and Russian are available for your selection.

For SIJECT OP15B FV2, English, Chinese, Spanish and one reserved language are available for your selection.

Operating Sequences

Change language: first move the cursor to the third line, then press softkey F1 to choose the desired language and confirm with Enter Key.

Refer to Fig. 3-8 Function Screen, language can be changed. Steps are as follows:

1. Press cursor key ▲ or ▼ to enter language selection box;
2. Press selection key ▣ (if it is the first entry, then input password of level one of 1111, then press Enter key to return to Function Screen);
3. The cursor moves to left, and choose by key ▲ or ▼ ;
4. Select one language;
5. Press Enter Key to confirm.

3.4.2 Service selection

General

Users can execute some basic setting and selections by this function.

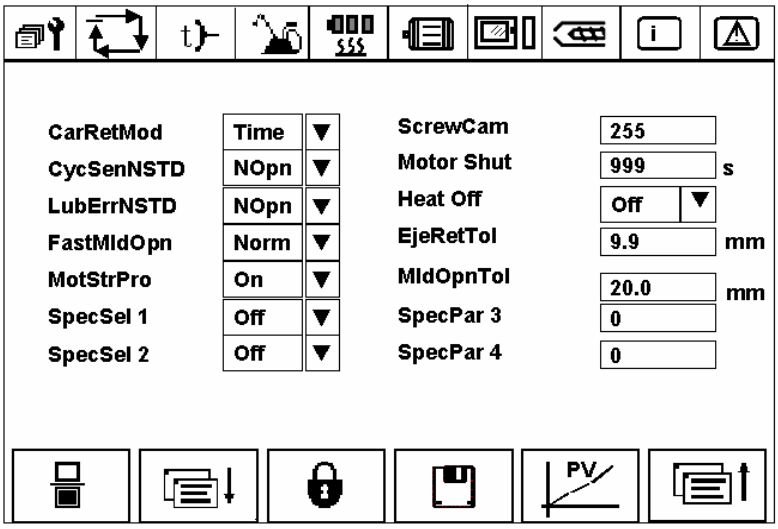


Fig. 3-9 Service Screen 1

Operating Sequences

Press Service Key to enter Service screen 1. See Fig.3-9.

Carriage retract mode (CarRetMod) --- Carriage retract can select position mode or time mode.

Cycle sensor not standard (CycSenNSTD) --- Sensor can be set as Normal Open mode (Nopn) mode or Normal Close (NClo) mode.

Lubrication error not standard (LubErrNSTD) --- Switch contact in the alarm circuit can be set as Normal Open mode (Nopn) mode or Normal Close (NClo) mode.

Fast mold open (FastMldOpn) --- It can be set as Normal mode (fast mold open) and special mode (slow mold open).

Motor protection (MotStrPro) --- Motor protection can be selected, i.e., whether to extend time during the start-up of star triangle. Motor protection also can be deselected.

Special selection 1 (SpecSel 1) --- Spare.

Special selection 2 (SpecSel 2) --- Spare.

Screw cam number (ScrewCam) --- During screw speed measurement, cam numbers set on the screw. Range: 1~ 255.

Motor shut --- When there is alarm, it is the time passing by from alarm occurring to motor shut. Range: 30~999.

Heat Off --- When alarm occurs, user selects whether to switch off the heater.

Ejector retract tolerance (EjeRetTol) --- When ejector selects linear scale, the tolerance of ejector retract can be set from 0.1~9.9 mm.

Mold open tolerance (MldOpnTol) --- The tolerance of mold open can be set from 1.0～99.9.

Special parameter 3 (SpecPar 3) --- Spare.

Special parameter 4 (SpecPar 4) --- Spare.

Operation Example To select position in carriage retract mode, you can do as follows:

1. Press cursor key or to enter CarRetMod selection;
2. Press selection key , and the cursor moves to left;
3. Press cursor key or to select “Pos”;
4. Confirm by Enter key.

3.4.3 Setting linear scale

General

Users can select two linear scales or three linear scales, and set reference point and length.

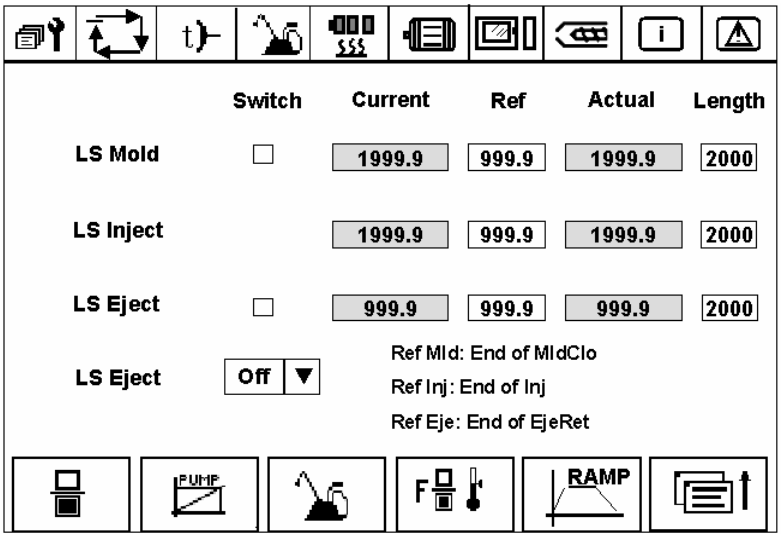


Fig. 3-10 Service Screen 2 --- linear scale setting

Operating sequences

Press softkey F2 to enter the next screen. See Fig. 3-10 Service screen 2 --- linear scale setting.

Linear Scale mold:

Switch --- Proximity switch signal. When mold close is at position, the box will backlight, showing the reference point of linear scale.

Reference point --- setting value. Mold lock end should be the reference of linear scale.

Length --- setting value. The length of linear scale can be set here, ranged from 1～6553mm.

Actual value --- displayed value. Display the actual value of linear scale.

Current value --- displayed value. It is the difference from actual value to reference point.

Linear scale injection:

Reference point --- setting value. Reference point of linear scale can be set here.

Length --- setting value. The length of linear scale can be set here, ranged from 1～6553mm.

Actual value --- displayed value. Display the actual value of linear scale.

Current value --- displayed value. It is the difference from actual value to reference point.

Linear scale ejector:

Switch --- Proximity switch signal. When ejector retract is at position, the box will backlight, showing the reference point of linear scale.

Reference point --- setting value. Ejector retract end should be the reference of linear scale.

Length --- setting value. The length of linear scale can be set here, ranged from 1～6553mm.

Actual value --- displayed value. Display the actual value of linear scale.

Current value --- displayed value. It is the difference from actual value to reference point.

Linear scale ejector --- Linear scale ejector can be selected or deselected here.

3.4.4 Setting password

General

The password has three levels. Password level 1 of factory setting is 1111 and level 2 is 2000. Refer to manufacturer for password of the highest level.

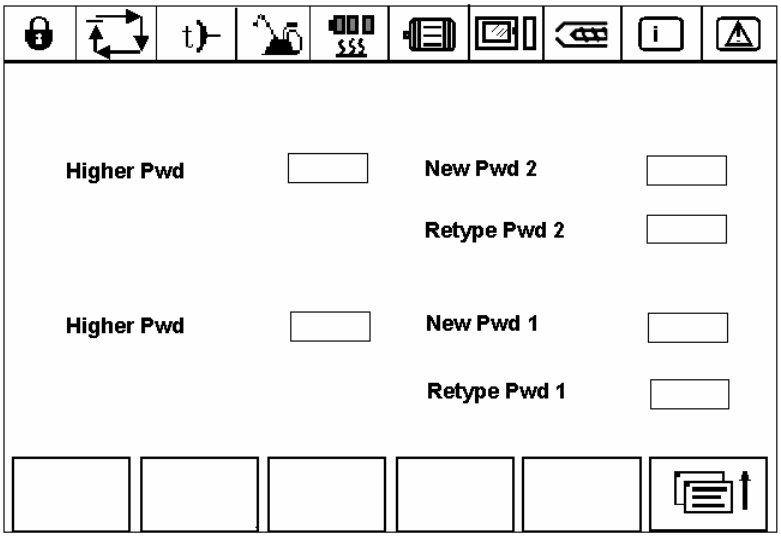


Fig. 3-11 Service Screen 1.1 --- password setting

Operating sequences

Press softkey F3 to enter password setting screen. See Fig. 3-11 Information screen 1.1 --- password setting, and password can be set and changed on this screen.

Upper:

Higher password --- the highest level. The default value of this system is xxxx (please ask the manufacturer), then confirm by Enter Key.

New Password 2 --- A new password 2 can be set here, then confirm it by Enter Key. The default value of this system is 2000.

Retype Password 2 --- retype the new set password 2, and confirm it by Enter Key.

When the password has been successfully changed, the screen will display a message. Press Acknowledgment Key to finish the operation.

Lower:

Higher password --- it is the password level 2. The default value of this system is 2000, then confirm by Enter Key.

New password 1 --- a new password 1 can be set here, then confirm by Enter Key. The default value of this system is 1111.

Retype password 1 --- retype the new set password 1, then confirm it by Enter Key.

When the password has been successfully changed, the screen will display a message. Press Acknowledgment Key to finish the operation.

3.4.5 Save/load setting

General

Users can save/load the PLC, menus and CSP (customer specific picture) by this function. It can save/load information to/from MMC.

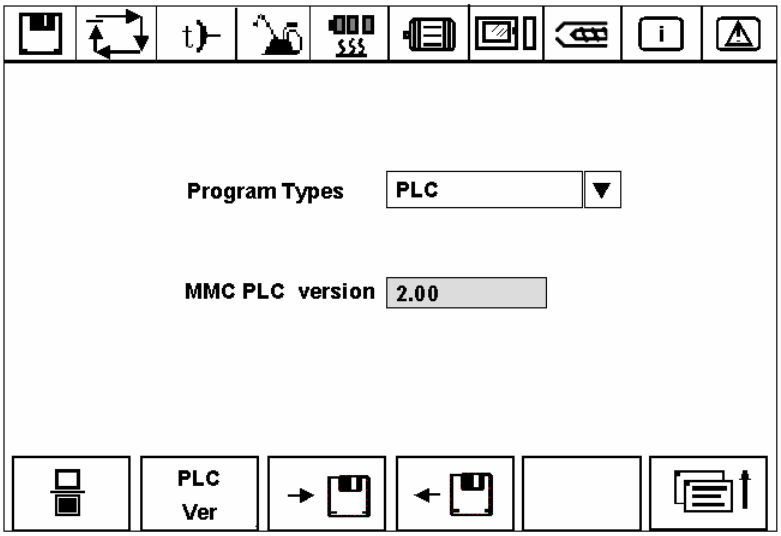


Fig. 3-12 Service Screen 1.2 --- save/load setting

Operating sequences

Press softkey F4 to enter save/load screen. The PLC/menus/CSP can be saved/loaded to/from MMC.

Program types --- User can select PLC, menus or CSP.

MMC PLC version --- displayed value. Press softkey F2 “PLC version” to show the PLC version in MMC.

Operating examples

To select Menus in Program types. Steps are as follows:

1. Press cursor key or to enter program type selection;
2. Press Selection Key , and the cursor moves to the left;
3. Press cursor key or to select “Menus”;
4. Press Enter Key to confirm the entry.

Download Menus from MMC. Steps are as follows:

1. Plug in MMC card in the CI (the operation should be done after turning off the power);
2. Select “Menus” in Program Type;
3. Press softkey F4 to start data transfer;
4. Restart the system after the transfer process is finished. The operation is over.

3.4.6 Proportional valve adjustment

General

Users can adjust the proportional valve and test it.

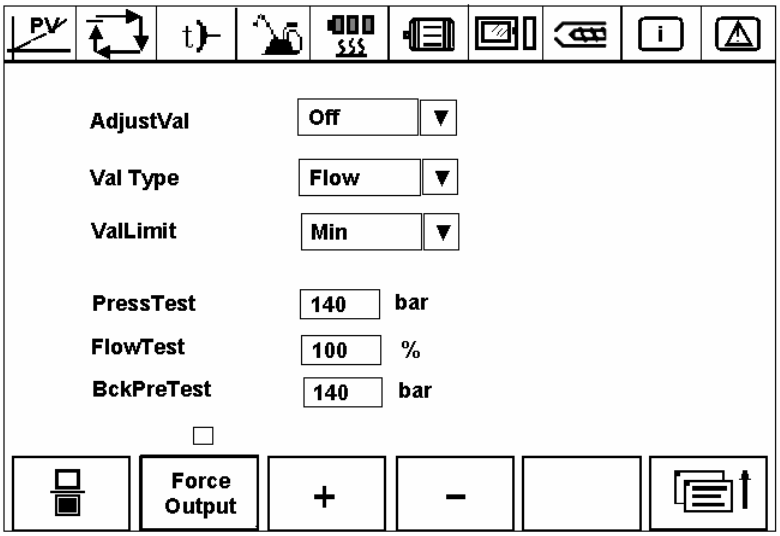


Fig. 3-13 Service Screen 1.3 --- proportional valve adjustment

Operating sequences

Press softkey F5 to enter proportional valve adjustment screen. See Fig. 3-13 Service Screen 1.3 --- proportional valve adjustment. Proportional valve can be adjusted here, and you can test pressure, flow and backpressure under force output mode.

Adjust Valve --- select On/Off to start valve adjustment.

Valve Type --- select the type of valve: flow / pressure / back-pressure / reserved.

Valve Limit --- select min. / max. value.

Pressure Test --- in force output mode, input pressure value, ranged from 0～140bar.

Flow Test --- in force output mode, input flow value, ranged from 0～100%.

BackPressure Test --- in force output mode, input pressure value, ranged from 0～140bar.

Operating sequences

Firstly, start valve adjustment:

Select “ON” in Adjust Valve mode:

1. Use cursor key ▲ or ▼ to enter valve adjustment selection;
2. Press selection key ▣, and the cursor moves to the left;
3. Use cursor key ▲ or ▼ to select “ON”;
4. Press Enter key to confirm.

Secondly, select valve type, such as pressure valve; then select valve limit, such as maximum:

Choose “Max.” in valve limit, and change its value by softkey:

1. Use cursor key ▲ or ▼ to enter valve adjustment selection;
2. Press selection key ▣ , and cursor moves to left;
3. Use cursor key ▲ or ▼ to select “Max.”;
4. Confirm it with Enter Key;
5. Press softkey F3 “＋” to increase the “Max.”; or use softkey F4 “-” to reduce “Max.”. This process can be observed by external amperemeter.

After finishing the adjustment of the valves, select “OFF” to stop valve adjustment.

Lastly, check the adjustment result:

In the “Force Output” mode, implement the “Pressure Test”:

1. Press softkey F2 “Force Output”, and the upper box will backlight;
2. Set the value of 140bar in Pressure Test;
3. Check if the external amperemeter reaches the maximum, such as 1Amp.

Caution

The handling with the Proportional valve is subject to the prerequisites that all the electrical wiring is completed and the power supply DC 24V / DC 38V is connected.

We describe the commisioning process as an example provided that the resistance of the proportional valve is 10Ω and 24VDC power supply is adopted. Therefore, it means that the max.output value of PV is reached when the pointer in the amperemeter indicates the maximal value of 1A, and the min. output value is reached when the pointer indicating 100mA (proportional flow valve) and 0 mA (proportional pressure valve).

3.4.7 Pump Combination Setting

General

User can set the pump combination according to different machine type, so as to optimize the energy.

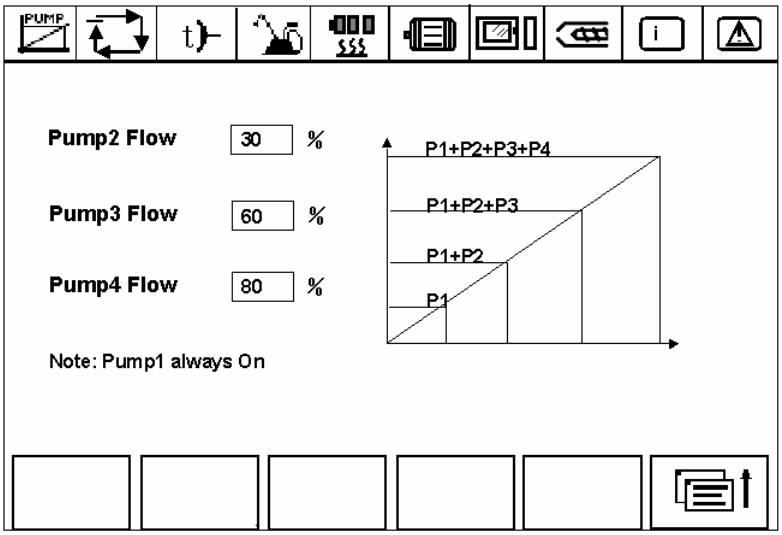


Fig. 3-14 Service Screen 2.1 --- pump combination setting

Operating sequences

On service screen 1, press softkey F2 to enter service screen 2 --- linear scale setting. Then, press softkey F2 PUMP to enter pump combination setting screen. See Fig. 3-14 Service Screen --- pump combination setting. Pump2/pump3/pump4 can be selected here and the flow can be set accordingly.

Pump2 Flow --- flow range 0～100％.

Pump3 Flow --- flow range 0～100％.

Pump4 Flow --- flow range 0～100％.

3.4.8 Lubrication setting

General

User can set the time and interval of lubrication.

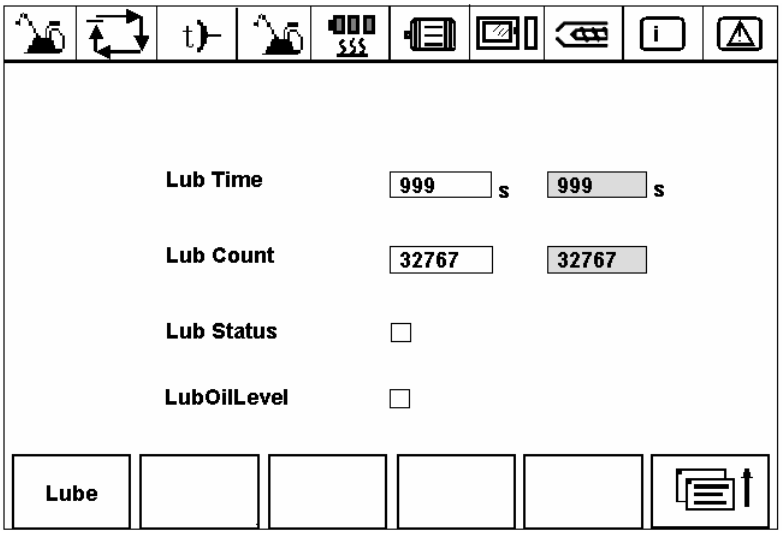


Fig. 3-15 Service Screen 2.2 --- lubrication setting

Operating sequences

On service screen 1, press softkey F2 to enter service screen 2 --- linear scale setting. Then press softkey F3 to enter lubrication setting screen. See Fig. 3-15 Service Screen 2.2 --- lubrication setting. Lubrication time and lubrication count can be set here.

Lubrication Time --- every lubrication time can be set here, ranged from 0～999sec.

Lubrication Count --- set numbers of injection cycle. The system will be lubricated automatically when the set injection cycles have been finished. The range is from 1 to 32767.

Lubrication Status --- Press softkey F1 “manual lubrication” to start the lubrication, then the box will backlight, and is flashing.

Lubrication Oil Level --- Inform the user to add lubrication oil when the oil level is very low, then the box will backlight and alarm occurs, i.e., is flashing.

3.4.9 Temperature setting

General

User can set temperature channel and temperature tolerance.

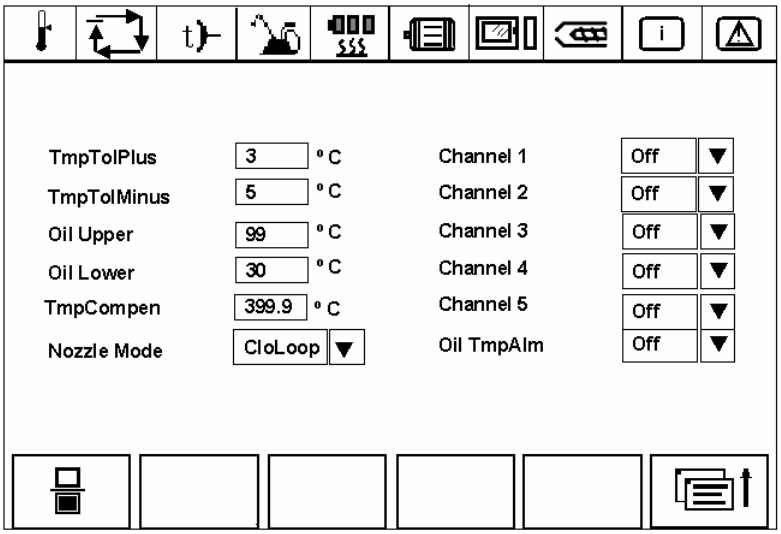


Fig. 3-16 Service Screen 2.3 --- Temperature setting

Operating sequences

On service screen 1, press softkey F2 to enter service screen 2 --- linear scale setting. Then, press softkey F4 so as to enter temperature setting screen. Temperature channel can be set from 1 to 5, and temperature can be set accordingly.

Temperature Tolerance Plus --- set the tolerance plus for each temperature channel.

Temperature Tolerance Minus --- set the tolerance minus for each temperature channel.

Oil Upper --- set the upper limit of hydraulic oil temperature.

Oil Lower --- set the lower limit of hydraulic oil temperature.

Temperature Compensation --- set the temperature compensation. The system has been set compensation before delivery, and it is unnecessary for users to set it.

Nozzle Mode --- two modes are available, it can be assigned as close-loop or open-loop.

Channel 1 --- select or deselect

Channel 2 --- select or deselect

Channel 3 --- select or deselect

Channel 4 --- select or deselect

Channel 5 --- select or deselect

Oil Temperature Alarm --- If oil temperature alarm is selected: when the upper/lower limit of oil temperature has been set, there is no alarm if oil temperature is within the specification and alarm occurs if it is out of specification.

Notice

The default type of the thermocouples is K unless otherwise programmed in the PLC application.

Normally the themperature compensation is intended only for the controller manufacturer to calibrate the offset of the electronic measurement device on the controller and every SIJECT is delivered in a compensated state. In case it should be necessary to re-compensate the thermocouple, i.e., the displayed temperature is different from the actual temperature value, please perform the following steps:

1. Measure the outside temperature with a thermometer before starting the heater；
2. Type in the outside temperature value;
3. Check the heater temperature on Temperature Screen. The displayed value must be exactly the measured outside temperature.

Caution

The thermocouple input is scanned every 80ms at intervals and the displayed temperature values on the screen will be refreshed every 720ms for all 8 thermocouple inputs and the ambient temperature.

The broken wire detection is done every 40 seconds at intervals. It makes a clicking sound at the same time.

3.4.10 Setting the ramp data

General

All the ramp data are assigned in order to moderate the running shake of the machine during the movement switch, so that the product service life can be extended.

Users should observe the machine movement diversification when adjusting the setting data and optimizing the parameters, until the machine can run smoothly.

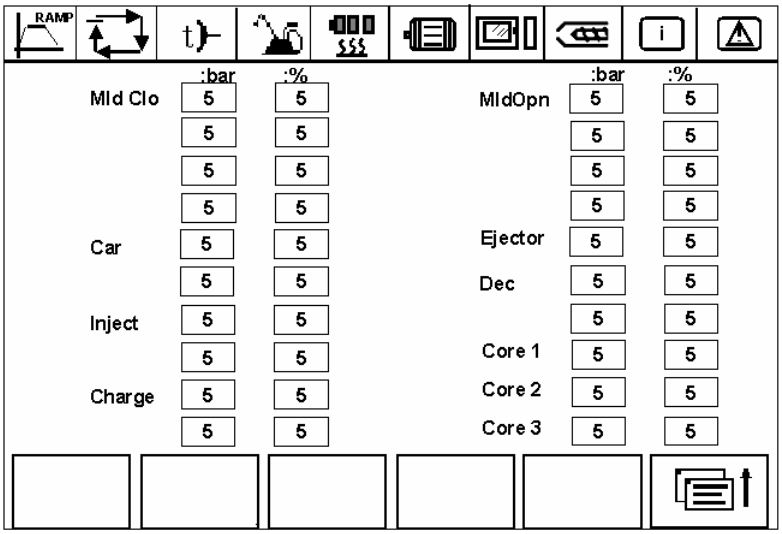


Fig 3-17 Service Screen 2.4 --- setting ramp data

Operating Sequences On service screen 1, press softkey F2 to enter service screen 2 --- linear scale setting. Then, press softkey F5 RAMP to enter ramp setting screen. See Fig. 3-17 Service Screen 2.4 --- setting ramp data. The ramp data for every movement can be set accordingly.

Mold Close --- there are four ramps to be set: pressure and flow for each ramp, and ranged from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Carriage --- it refers to the ramps during carriage advance and carriage retract: set pressure and flow for each, and ranged from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Inject --- it refers to the ramps when injection starts and injection completes: set pressure and flow for each, and the range is from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Charge --- it refers to the ramps when charging starts and charging completes: set pressure and flow for each, and the range is from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Mold Open --- there are four ramps to be set: pressure and flow for each ramp, and ranged from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Ejector --- it is the ramp before and after the actions of ejector: set pressure and flow for each, and the range is from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Decompression --- they are the ramps when decompression begins and decompression completes: set pressure and flow for each, and the range is from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch：

Core 1 --- it is the ramp for core 1 in/out: set pressure and flow for each, and the range is from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Core 2 / Core 3 --- the operating sequence is same as Core 1.

3.5 Up-/Downloading and Deleting PLC Program

3.5.1 Up-/Downloading and Deleting PLC Program

General

The highlight of SIJECT16i consists in that the PLC program can be up-/downloaded whenever you wish. In addition, users can clear the memory of PLC CPU memory as required. You can modify the program in your PC/PG after you are in the programming environment.

SIMATIC Manager is the basic programming and configuration software for SIMATIC. It is made up of a series of applications intended to create and test user program.

Preconditions

To up-/download the PLC program you need the following:

- A PC/PG with RS232 interface;
- MPI adapter and an appropriate cable;
- SIMATIC STEP7 programming tool in CD;
- MMC card.

The **Mode Selector S1** must be set in **RUN_P** position prior to up-/downloading PLC program!

Notice

The MMC card can be used to save/load the PLC program. Carry out external data saving before you up-/download the program. See 3.1.4 “recipe data saving”.

Up-/Download Procedure

Uploading and downloading of PLC program should be done by use of SIMATIC Manager.

Upload PLC program in SIJECT16i:

1. Start the SIMATIC Manager in PC/PG;
2. Choose the menu **PLC** in the tool bar;
3. Select the menu command **Upload**;
4. Press on the symbol and then release.

Now the Uploading process is finished.

Download PLC program in SIJECT 16i:

1. Start the SIMATIC Manager in PC/PG;
2. Click the menu **PLC** in the tool bar;
3. Select the menu command **Download**;
4. Press on the symbol Download and then release.

Now the Downloading process is finished.

Deleting PLC program

If you want to delete PLC program, two choices are available:

Method One: Use SIMATIC STEP7

1. Open STEP7 (V5.2+SP1);
2. From **PLC** menu in the tool bar, choose command **Start > Diagnostic/Setting > Clear/Reset.**

Method Two: Use screwdriver

1. Switch the mode selector S1 to position **MRES** by screwdriver;
2. Hold the switch at this position until the yellow STOP LED (on CI module) lights up for the second time and stays on （when switch S1 from RUN_P position to MRES, S1 will pass by STOP position, and the STOP LED will light on once). Then turn the mode selector S1 to position **STOP**;
3. After 3 seconds, switch the mode selector S1 back to **MRES.** The STOP LED will flash rapidly and the CPU memory is reset;
4. Turn the mode selector S1 to **STOP**. When the STOP LED lights up permanently, the CPU memory reset is finished;
5. Switch the mode selector S1 to **RUN_P**.

Note: Sometimes, there will be message to inform system error when PLC program has been deleted. Under the circumstances, you can use screwdriver to clear CPU memory once more as mentioned above.

3.5.2 Automatic uploading of PLC application to PLC module

General

In addition to save/load PLC application by OP menu stated in Section 3.4.5, PLC application can also be uploaded to PLC module from MMC card automatically when there is no PLC application in PLC module.

Operating sequence

1. Switch the machine off;
2. Plug in a MMC card with PLC application in it;
3. Switch the machine on;
4. Set the Mode Selector S1 in RUN-P position;
5. The PLC application can only be uploaded automatically, if:
   - PLC module does not contain any PLC application;
   - Green Run-LED should be on stably at least for 6 seconds to give the PLC application enough time to startup;
   - A PLC application matching the used type of PLC module is stored on the MMC card.
6. Switch the machine off;
7. Remove the MMC card from the CI;
8. Switch the machine on again and continue the normal operation.

Notice: Same as downloading a new PLC program from MMC, after downloading PLC application from PC/PG, also be sure to switch the machine off, then switch on again.

Note:

Since the uploading operation is not triggered by the OP, there will be no indication of the progress of uploading on an OP15 or OP15B operator panel and any request from those OP's will be ignored. On a Simatic-OP connected to the MPI, there will be no indication anyway, since the PLC module is kept in RESET and no MPI service available. In both cases, termination of the upload can be detected only by monitoring the LED's of the PLC module on the CI board.

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4 Programming Tool

4.1 SIMATIC Manager

Introduction

STEP7 is the basic programming and configuration software for SIMATIC. It is made up of a series of applications, each of which does a specific job within the scope of programming an automation task, such as:

- configuring and assigning parameters to the hardware
- creating and debugging user programs
- configuring networks and connections

The basic package can be extended by a range of optional packages, for example, additional programming language packages, such as SCL, S & Graph, or HiGraph.

The graphic user interface provided for these tasks is known as the SIMATIC Manager. The SIMATIC Manager collects all the data and the settings necessary for an automation task together in a project. Within this project the data are structured according to their function and represented objects.

Notice

To operate the **SIMATIC Manager,** please order the software and program.

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5 Technical Appendix

5.1 Definition of DB1

Address	Type	Description
DB1.DBX0.0	Key	Cycle stop
DB1.DBX0.1	Key	Heater start
DB1.DBX0.2	Key	Heater stop
DB1.DBX0.3	Key	Mold open
DB1.DBX0.4	Key	Mold close
DB1.DBX0.5	Key	Ejector retract
DB1.DBX0.6	Key	Ejector advance
DB1.DBX0.7	Key	Carriage advance
DB1.DBX1.0	Key	Semi-auto mode
DB1.DBX1.1	Key	Photo-sensor full-auto mode
DB1.DBX1.2	Key	Timer full-auto mode
DB1.DBX1.3	Key	Cycle run
DB1.DBX1.4	Key	Manual mode
DB1.DBX1.5	Key	Mold adjustment mode
DB1.DBX1.6	Key	Motor start
DB1.DBX1.7	Key	Motor stop
DB1.DBX2.0	Key	Air blow 1
DB1.DBX2.1	Key	Air blow 2
DB1.DBX2.2	Key	Mold adjustment retract
DB1.DBX2.3	Key	Mold adjustment advance
DB1.DBX2.4	Key	Lubrication
DB1.DBX2.5	Key	Purge (start)
DB1.DBX2.6	Key	Purge (stop)
DB1.DBX2.7	Key	ACK
DB1.DBX3.0	Key	Carriage retract
DB1.DBX3.1	Key	Injection
DB1.DBX3.2	Key	Decompression
DB1.DBX3.3	Key	Charge
DB1.DBX3.4	Key	Core 1 in
DB1.DBX3.5	Key	Core 1 out
DB1.DBX3.6	Key	Core 2 in
DB1.DBX3.7	Key	Core 2 out
DB1.DBX4.0	Key	Core 3 in
DB1.DBX4.1	Key	Core 3 out

Address	Type	Description
DB1.DBX4.2	Key	Auto mold adjustment start
DB1.DBX4.3	Key	Auto mold adjustment stop
DB1.DBX4.4	Key	Product counter reset
DB1.DBX4.5	Key	Injection reset
DB1.DBX4.6	Key	Confirm update time
DB1.DBX4.7	Key	Force output
DB1.DBB5	Type of value:	0: recipe byte 1: recipe word 2: actual value 252: packed variable
DB1.DBB6	Data from OP to PLC	DB1.dummy1
DB1.DBB7		DB1.val_index
DB1.DBW8		DB1.op_value
DB1.DBB10		DB1.op_spare1
DB1.DBB11		DB1.read_or_write
DB1.DBB12	DB1.op_comm	Semaphore "OP_COMM" FF = data from OP are in DBW0—DBW10 00 = PLC has read the data and stored in DBW20--DBW24
DB1.DBB13		Dummy 2
DB1.DBW14		Dummy 3
DB1.DBW16		Dummy 4
DB1.DBW18		Dummy 5
DB1.DBB20		Spare for LED
DB1.DBX21.0	LED	Motor start
DB1.DBX21.1	LED	Mold adjustment mode
DB1.DBX21.2	LED	Manual mode
DB1.DBX21.3	LED	Cycle run
DB1.DBX21.4	LED	Photo-sensor full-auto mode
DB1.DBX21.5	LED	Timer full-auto mode
DB1.DBX21.6	LED	Semi-auto mode
DB1.DBX21.7	LED	Heater start
DB1.DBW22	Data from PLC to OP	DB1.plc_value
DB1.DBW24	DB1.plc_spare	
DB1.DBW26		Dummy6
DB1.DBB28		00 = type "J" thermocouple FF = type "K" thermocouple
DB1.DBB29		00 = no process alarm FF = have process alarm
DB1.DBW30		Life counter (incremented by PLC program)
DB1.DBB32		00 = PLC start up not finished and ready FF = PLC start up finished and ready
DB1.DBB33		Screw pulses/round

Address	Type	Description
DB1.DBB34		PLC version-number YY
DB1.DBB35		PLC version-number XX
DB1.DBB36		Dummy 8
DB1.DBW37		Bit0: Machine ready (0: ready 1: running); Bit1: OP selection (0:OP15 1:Simatic OP); Bit2: PV selection (0:OP15 1:Simatic OP);
DB1.DBW38		Shot counter actual value
DB1.DBX40.0	X301: DQ1.0	Mold close valve
DB1.DBX40.1	X301: DQ1.1	Mold close fast valve
DB1.DBX40.2	X301: DQ1.2	Mold open valve
DB1.DBX40.3	X301: DQ1.3	Mold open fast valve
DB1.DBX40.4	X301: DQ1.4	Mold adjustment advance valve
DB1.DBX40.5	X301: DQ1.5	Mold adjustment retract valve
DB1.DBX40.6	X301: DQ1.6	Ejector advance valve
DB1.DBX40.7	X301: DQ1.7	Ejector retract valve
DB1.DBX41.0	X300: DQ0.0	Core 1 in valve
DB1.DBX41.1	X300: DQ0.1	Core 1 out valve
DB1.DBX41.2	X300: DQ0.2	Core 2 in valve
DB1.DBX41.3	X300: DQ0.3	Core 2 out valve
DB1.DBX41.4	X300: DQ0.4	Carriage advance valve
DB1.DBX41.5	X300: DQ0.5	Carriage retract valve
DB1.DBX41.6	X300: DQ0.6	Charge valve
DB1.DBX41.7	X300: DQ0.7	Injection valve
DB1.DBX42.0	X303: DQ3.0	Heater Nozzle
DB1.DBX42.1	X303: DQ3.1	Heater output 2
DB1.DBX42.2	X303: DQ3.2	Heater output 3
DB1.DBX42.3	X303: DQ3.3	Heater output 4
DB1.DBX42.4	X303: DQ3.4	Heater output 5
DB1.DBX42.5	X303: DQ3.5	
DB1.DBX42.6	X303: DQ3.6	
DB1.DBX42.7	X303: DQ3.7	
DB1.DBX43.0	X302: DQ2.0	Decompression valve
DB1.DBX43.1	X302: DQ2.1	Pump 2
DB1.DBX43.2	X302: DQ2.2	Zero back pressure valve
DB1.DBX43.3	X302: DQ2.3	Robot
DB1.DBX43.4	X302: DQ2.4	Core 3 in valve
DB1.DBX43.5	X302: DQ2.5	Core 3 out valve
DB1.DBX43.6	X302: DQ2.6	Air blow 1

Address	Type	Description
DB1.DBX43.7	X302: DQ2.7	Air blow 2
DB1.DBX44.0	X304: DQ4.0	Motor star start
DB1.DBX44.1	X304: DQ4.1	Motor triangle start
DB1.DBX44.2	X304: DQ4.2	Motor start
DB1.DBX44.3	X304: DQ4.3	Alarm LED
DB1.DBX44.4	X304: DQ4.4	Lubrication pump
DB1.DBX44.5	X304: DQ4.5	Alarm buzzer
DB1.DBX44.6	X304: DQ4.6	
DB1.DBX44.7	X304: DQ4.7	
DB1.DBX45.0	Analog output 0 type	0 = unipolar (0-10V), 1 = bipolar(-10V-10V)
DB1.DBX45.1	Analog output 0 type	0 = unipolar (0-10V), 1 = bipolar(-10V-10V)
DB1.DBX45.2	Analog output 0 type	0 = unipolar (0-10V), 1 = bipolar(-10V-10V)
DB1.DBX45.3	Analog output 0 type	0 = unipolar (0-10V), 1 = bipolar(-10V-10V)
DB1.DBX45.4		
DB1.DBX45.5		
DB1.DBX45.6		
DB1.DBX45.7		
DB1.DBW46	X305: AQ1	Analog output 1: pressure (0-140 Bar)
DB1.DBW48	X305: AQ2	Analog output 2: flow (0-100%)
DB1.DBW50	X305: AQ3	Analog output 3: back pressure (0-140 Bar)
DB1.DBW52	X305: AQ4	Analog output 4: spare (0-100%)
DB1.DBW54		Dummy10
DB1.DBW56		Dummy11
DB1.DBB58		Dummy12
DB1.DBX59.0		0 = OK 1 = failure of power supply of the linear scale
DB1.DBX59.1		0 = battery normal 1 = battery alarm
DB1.DBX59.2		
DB1.DBX59.3		
DB1.DBX59.4		
DB1.DBX59.5		
DB1.DBX59.6		
DB1.DBX59.7		
DB1.DBX60.0	X204: DI1.0	Safety door 2
DB1.DBX60.1	X204: DI1.1	Back door
DB1.DBX60.2	X204: DI1.2	Emergency stop

Address	Type	Description
DB1.DBX60.3	X204: DI1.3	Carriage advance end
DB1.DBX60.4	X204: DI1.4	Carriage retract end
DB1.DBX60.5	X204: DI1.5	Ejector advance end
DB1.DBX60.6	X204: DI1.6	Ejector retract end
DB1.DBX60.7	X204: DI1.7	Mold close end
DB1.DBX61.0	X203: DI0.0	
DB1.DBX61.1	X203: DI0.1	
DB1.DBX61.2	X203: DI0.2	
DB1.DBX61.3	X203: DI0.3	
DB1.DBX61.4	X203: DI0.4	
DB1.DBX61.5	X203: DI0.5	
DB1.DBX61.6	X203: DI0.6	
DB1.DBX61.7	X203: DI0.7	
DB1.DBX62.0	X206: DI3.0	Safety door 1
DB1.DBX62.1	X206: DI3.1	Lubrication error
DB1.DBX62.2	X206: DI3.2	Mold adjustment photo-sensor
DB1.DBX62.3	X206: DI3.3	Full-auto photo-sensor
DB1.DBX62.4	X206: DI3.4	Robot
DB1.DBX62.5	X206: DI3.5	Core 3 in end / counter sensor
DB1.DBX62.6	X206: DI3.6	Core 3 out end
DB1.DBX62.7	X206: DI3.7	Screw speed sensor
DB1.DBX63.0	X205: DI2.0	Mold adjustment advance end
DB1.DBX63.1	X205: DI2.1	Mold adjustment retract end
DB1.DBX63.2	X205: DI2.2	Core 1 in end / counter sensor
DB1.DBX63.3	X205: DI2.3	Core 1 out end
DB1.DBX63.4	X205: DI2.4	Core 2 in end / counter sensor
DB1.DBX63.5	X205: DI2.5	Core 2 out end
DB1.DBX63.6	X205: DI2.6	Injection safety door
DB1.DBX63.7	X205: DI2.7	Motor overload
DB1.DBW64		Screw speed actual value
DB1.DBW66	X200: TI1	Analog input TC: 1(nozzle)
DB1.DBW68	X200: TI2	Analog input TC: 2
DB1.DBW70	X200: TI3	Analog input TC: 3
DB1.DBW72	X200: TI4	Analog input TC: 4
DB1.DBW74	X201: TI5	Analog input TC: 5
DB1.DBW76	X201: TI6	Analog input TC: 6 (oil)
DB1.DBW78	X201: TI7	

Address	Type	Description
DB1.DBW80	X201: TI8	
DB1.DBW82		Dummy13
DB1.DBW84	X202: AI1	Analog input linear scale 1 (0-10V): mold
DB1.DBW86	X202: AI2	Analog input linear scale 2 (0-10V): screw
DB1.DBW88	X202: AI3	Analog input linear scale 3 (0-10V): ejector
DB1.DBW90	X202: AI4	Analog input linear scale 4 (0-10V): carriage
DB1.DBB92		Semaphore "MEM_COMM" 0 = finished 1 = put recipe into DB2 2 = get recipe from DB2
DB1.DBB93	DB1.recipe_nr	Recipe-number
DB1.DBW94	DB1.recipe_len	Length of recipe (unit: byte)
DB1.DBW96	DB1.recipe_data ARRAY[0..1023] of byte	The starting address for recipe DB1.DBB96—DB1.DBB1119
DB1.DBW1120— DB1.DBW1150	DB1.comm_errors ARRAY[0..15] of word	Error **(for internal use only! Don't use on customer side.)**
DB1.DBW1152	DB1.io_errors	Error **(for internal use only! Don't use on customer side.)**
DB1.DBW1154	DB1.perf_errors	Error **(for internal use only! Don't use on customer side.)**
DB1.DBB1226	Filter for analog_in_fast 0	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** in section 2.3.8
DB1.DBB1227	Filter for analog_in_fast 1	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** in section 2.3.8
DB1.DBW1228	Filter for analog_in_fast 2	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics
DB1.DBB1229	Filter for analog_in_fast 3	Filter configuration: 0: Filter is disabled;

Address	Type	Description
		1 … 15: different filter characteristics
DB1.DBW1230	X207: analog_in_fast 0	In Volts (0…10), process data to PLC
DB1.DBW1232	X207: analog_in_fast 1	In Volts (0…10), process data to PLC
DB1.DBB1188	Virtual communication	Rx flag, the PLC sets this flag to indicate to the IO software that there is a new instruction in Rx meaning, Rx length and Rx buffer. The IO software resets this flag after processing the buffer.
DB1.DBB1189	Virtual communication	Rx meaning, instruction according to the protocol specification
DB1.DBB1190	Virtual communication	Rx length, length of valid data in Rx buffer
DB1.DBB1191 --- DB1 DBB1206	Virtual communication	Rx buffer
DB1.DBB1207	Virtual communication	Tx flag, the IO software sets this flag to indicate to the PLC that there is a new message in Tx meaning, Tx length and Tx buffer. The PLC resets this flag after processing the buffer
DB1.DBB1208	Virtual communication	Tx meaning, instruction according to the protocol specification
DB1.DBB1209	Virtual communication	Tx length, length of valid data in Tx buffer
DB1.DBB1209	Virtual communication	Tx length, length of valid data in Tx buffer
DB1.DBB1210 --- DB1.DBB1225	Virtual communication	Tx buffer
DB1.DBB1290	Filter for linear scale analog_input_1	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** in section 2.3.7
DB1.DBB1291	Filter for linear scale analog_input_2	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** in section 2.3.7
DB1.DBB1292	Filter for linear scale analog_input_3	Filter configuration: 0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** in section 2.3.7
DB1.DBB1293	Filter for linear scale	Filter configuration:

Address	Type	Description
	analog_input_4	0: Filter is disabled; 1 … 15: different filter characteristics For detailed explanations, see **Remarks 2: A/D Conversion time** in section 2.3.7

5.2 Comparator Mode

DB1 Location	Function		Description	
DBW1238	Enable Comparator #1	Exit status of Comparator #1 (Status)	0x00=disable comparator #1, 0x01= enable comparator #1.	0x00=o.k. 0x01= threshold #1 already reached when starting. 0x02= Time out. 0x03= Invalid configuration.
DBW1240	Timer		Timer value in multiples of the the periodic timer interrupt (multiples of 1ms) 0= Timer disabled.	
DBW1242	Define which LS-AI/FAI to read (poll)	Dummy 15	An selected analog input for comparator's polling by PLC. 0x00=no selection; 0x01= LS_AI0, 0x02= LS_AI1, 0x03=LS_ AI2, 0x04=LS_AI3, 0x11=FAI0, 0x12=FAI1.	
DBW1244	Define which AQ is the first AQ to write	Define which AQ is the second AQ to write	The first AQ selected by PLC 0x00=no selection; 0x01=AQ1; 0x02=AQ2; 0x03=AQ3; 0x04=AQ4.	The second AQ selected by PLC must be different from the first AQ. 0x00=no selection; 0x01=AQ1; 0x02=AQ2; 0x03=AQ3; 0x04=AQ4.
DBW1246	Define first DQ to write	Define second DQ to write	0x00=no selection 0x01…0x28= selects DQ1…DQ40.	0x00=no selection 0x01…0x28= selects DQ1…DQ40.
DBW1248	Define third DQ to write	Define fourth DQ to write	0x00=no selection 0x01…0x28= selects DQ1…DQ40.	0x00=no selection 0x01…0x28= selects DQ1…DQ40.
DBW1250	Comparator value threshold #1		Value for starting Comparator Mode	
DBW1252	Comparator value threshold #2		Value for triggering outputs	
DBW1254	AQ output value #1		Value for first AQ selected above	
DBW1256	AQ output value #2		Value for second AQ selected above	
DBW1258	DQ output value	DQ output value	Value for first DQ selected above	Value for second DQ selected above
DBW1260	DQ output value	DQ output value	Value for third DQ selected above	Value for fourth DQ selected above

DB1 Location	Function		Description	
DBW1264	Enable Comparator #2	Exit status of Comparator #2 (Status)	0x00=disable comparator #2, 0x01= enable comparator #2.	0x00=o.k. 0x01= threshold #2 already reached when starting. 0x02= Time out. 0x03= Invalid configuration
DBW1266	Timer		Timer value in multiples of the the periodic timer interrupt (multiples of 1ms) 0= Timer disabled	
DBW1268	Define which LS-AI/FAI to read (poll)	Dummy 17	An selected analog input for comparator's polling by PLC. 0x00=no selection; 0x01= LS_AI0, 0x02= LS_AI1, 0x03=LS_ AI2, 0x04=LS_AI3, 0x11=FAI0, 0x12=FAI1.	
DBW1270	Define which AQ is the first AQ to write	Define which AQ is the second AQ to write	The first AQ selected by PLC 0x00=no selection; 0x01=AQ1; 0x02=AQ2; 0x03=AQ3; 0x04=AQ4.	The second AQ selected by PLC must be different from the first AQ. 0x00=no selection; 0x01=AQ1; 0x02=AQ2; 0x03=AQ3; 0x04=AQ4.
DBW1272	Define first DQ to write	Define second DQ to write	0x00=no selection 0x01…0x28= selects DQ1…DQ40.	0x00=no selection 0x01…0x28= selects DQ1…DQ40.
DBW1274	Define third DQ to write	Define fourth DQ to write	0x00=no selection 0x01…0x28= selects DQ1…DQ40.	0x00=no selection 0x01…0x28= selects DQ1…DQ40.
DBW1276	Comparator value threshold #1		Value for starting Comparator Mode	
DBW1278	Comparator value threshold #2		Value for triggering outputs	
DBW1280	AQ output value #1		Value for first AQ selected above	
DBW1282	AQ output value #2		Value for second AQ selected above	
DBW1284	DQ output value	DQ output value	Value for first DQ selected above	Value for second DQ selected above
DBW1286	DQ output value	DQ output value	Value for third DQ selected above	Value for fourth DQ selected above

5.3 Glossary abbreviation

AC	Alternating current
AI	Analog input
AQ	Analog output
ADC	Analog-digital conversion
BATF	Battery fault
CORA	Coupling RAM Arbiter
CI	Compact interface
CPU	Central processing unit
CSP	Customer specific picture
DAC	Digital –analog conversion
DC	Direct current
DI	Digital input
DQ	Digital output
DPSF	CPU 3xxDP system fault
DPSTAT	CPU 3xxDP system status
DRAM	Dynamic RAM
FRCE	Force
HW	Hardware
LCD	Liquid crystal display
LED	Light Emitting Diode
LS	Linear scale
MMC	Multi-media card
MPI	Multi-port input
MRES	Reset memory
OP	Operator panel
PC/PG	Programming device
PV	Proportion valve
PROFIBUS	Profi_Bus
P_BUS	Periphery Bus
PLC	Program logic controller
RECIPE	Recipe
RUN－P	Program run
SRAM	Static RAM
SF	System fault
SW	Software
TI	Temperature input

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